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EXTENDED ARRAY EVALUATION PROGRAM. SPECIAL REPORT NO. 5. SELECTION OF REFERENCE WAVEFORMS FOR MATCHED FILTER PROCESSING OF LONG PERIOD SIGNALS FROM SEISMIC EVENTS

Rudolf Unger

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SELECTION OF REFERENCE WAVEFORMS FOR MATCHED FILTER PROCESSING OF LONG PERIOD SIGNALS FROM SEISMIC EVENTS

SPECIAL REPORT NO. 5

EXTENDED ARRAY EVALUATION PROGRAM

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ABSTRACT

In an attempt to find optimum reference waveforms for matched filtering long period signals, several reference waveforms varying in duration and signal contents were taken from Alaskan Long Period Array recordings of major events in the Sinkiang Province area. Each of these reference waveforms was used as a matched filter in processing a number of other events in the same area. The events differ in magnitude, location and depth. Analysis of the signal-to-noise ratio gains (relative to bandpass filtering) showed that optimum processing of all events required a large number of reference waveforms. This processing yielded up to 8 dB improvement over to-date routine matched filter processing of Central Asia events. Several other aspects of reference waveform matched filtering also are discussed.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In an attempt to find optimum reference waveforms for matched filtering long period signals, several reference waveforms varying in duration and signal contents were taken from Alaskan Long Period Array recordings of major events in the Sinkiang Province area. Each of these reference waveforms was used as a matched filter in processing a number of other events in the same area. The events differ in magnitude, location and depth. Analysis of the signal-to-noise ratio gains (relative to bandpass

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filtering) showed that optimum processing of all events required a large number of reference waveforms. This processing yielded up to 8 dB improvement over to-date routine matched filter processing of Central Asia events. Several other aspects of reference waveform matched filtering also are discussed.

SECTION I
INTRODUCTION

Previous studies (Texas Instruments, 1971; 1972) have shown that when using a long period signal from one seismic event as a reference waveform for matched filtering other events in a given area, some uncertainties exist about the selection of:

- the reference event
- the part of the reference event signal that will yield maximum processing gain.

This study analyzes the effects that various choices of reference waveforms have on matched filter processing using existing routine processing programs. Analysis is performed on Alaskan Long Period Array (ALPA) recordings of events in the Sinkiang Province area.

Section II of this report discusses general signal processing and seismological considerations regarding reference waveform matched filtering. Section III describes the analysis approach taken on the study, and the data processing procedures followed. In Section IV the results are interpreted in terms of the optimum reference event and the optimum reference waveform length, taking into account the effects of location and magnitude. This section also compares optimum processing gains with to-date routine processing gains, and analyzes gain differences between the vertical and the radial component. Finally, Section V summarizes the results of the study.

SECTION II

GENERAL CONSIDERATIONS

A. INTRODUCTION

Before starting the experimental search for an optimum type reference waveform we review some signal-processing and seismological elements involved in reference waveform matched filtering, which form the basis for the study organization and the data analysis. Also, the matched filtering effects on false alarm rate and surface wave magnitude measurement are discussed briefly.

B. SIGNAL PROCESSING CONSIDERATIONS

For the case of a noise-free, uniform-envelope, dispersed reference waveform which is an exact replica of the target signal buried in band-limited white background noise, the processing gain approximately equals the time-bandwidth product (Capon, 1967). When using the signal from one seismic event to process another event in the same area, the reference waveform is not noise-free, does not have a uniform envelope, is not an exact replica of the other signal, and the noise is non-white. Therefore, the expected processing gain in this type of filtering is less than the time-bandwidth product. However, a long-duration, wide-band, high signal-to-noise ratio reference waveform still would yield maximum processing gain provided that significant signal similarity is maintained over the entire signal duration. When signal similarities are of a limited duration, a shorter duration reference waveform must be selected. Because of dispersion this means that

the reference waveform contains a narrower frequency band, and the processing gain is reduced by both factors in the time-bandwidth product.

Another aspect of reference waveform processing is the effect on noise. Considering first the bandpass effect of the matched filter we note that the shape of the reference waveform magnitude spectrum (which generally is non-white) can change the output noise power relative to the input noise power. The effect can either increase or decrease the processing gain, depending on the relative shapes of the signal and noise spectra. Secondly, if some of the noise waveforms are in phase with part of the reference waveform the noise will correlate to some extent with the reference waveform, which reduces the processing gain.

C. SEISMOLOGICAL CONSIDERATIONS

Signal-to-noise ratio and signal similarities of events are determined by:

- Source mechanism (including depth effects)
- Event magnitude
- Travel path

The source mechanism determines the frequency spectrum and the radiation pattern. Depending on the geological structure, events at different locations and at different depths in general have different source mechanisms. Events of nearly the same location generally have similar mechanisms, but the event magnitudes may differ. Signals generated at different locations propagate along different paths, causing differences in dispersion, multipathing, and frequency-dependent attenuation. The spectrum generated at the source, the dispersion, the multipathing, and the frequency-dependent attenuation determine the signal shape upon arrival at the array; the magnitude, the radiation

pattern, the attenuation, and the noise behavior during the signal arrivals determine its signal-to-noise ratio.

In reference waveform matched filtering the reference events are chosen for their expected signal similarity and signal-to-noise ratio based on event location, magnitude and depth.

D. FALSE ALARM CONSIDERATIONS

Since a relatively large number of reference waveforms must be generated to enable finding optimum waveforms, this could increase the false alarm rate, depending on the detection criterion used. In ALPA and NORSAR long period processing the criterion requires that, within the expected signal arrival gate, the matched filter output contain a peak at least 3 dB larger than any noise peak within about 30 minutes of the signal gate noise. A false alarm is created when, according to this criterion, a signal is detected in the filter output while the input consists of noise only.

The false alarm rate can be estimated by applying matched filter reference waveforms to a number of noise gates. The false alarm rate, when using the above detection criterion, is expected to be less than 1 percent, even if more than one reference or chirp waveform are used (Texas Instruments, 1973). For this study the false alarm rate maybe somewhat higher because of the large number of reference waveform used. Time did not permit an analysis of the false alarm rate; this should be done in the future. We would not expect it to be significantly increased, however.

E. SURFACE WAVE MAGNITUDE CONSIDERATIONS

The surface wave magnitude is given by

$$M_s = \log \frac{A}{T} + 1.66 \log \Delta \qquad \text{(II. 1)}$$

where A = signal peak amplitude ($m\mu$)

T = signal peak period (sec)

Δ = epicentral distance (degrees)

Matched filtering generally will cause changes in A and T which would distort the M_s measurement. In ALPA and NORSAR long period processing the filter gain is compensated by subtracting the logarithm of the regional average gain as follows:

$$M_s = \log \frac{A}{T} + 1.66 \log \Delta - \frac{1}{20} G_m \tag{II. 2}$$

where G_m = regional average filter gain in dB.

A gain deviation of, for example, 3 dB about the average gain would cause a deviation in M_s of 0.15. A change in signal peak period T of, for example, 5 sec would cause an M_s deviation of 0.10. Deviations in A and T are in general smaller and the resulting change of less than 0.25 in M_s, compared with a typical standard deviation of 0.5, is not considered a major distortion in the measurement of surface wave magnitudes.

SECTION III

ORGANIZATION AND PROCEDURES

A. INTRODUCTION

To pursue the objective of this study, three Sinkiang Province events were chosen as reference events. From each reference event signal trace, eight different reference waveform lengths were generated by selecting different time windows. Each of the total of twenty-four reference waveforms thus obtained was then used as a matched filter in processing each of twenty-one Sinkiang Province test events. The resulting signal-to-noise ratio gains relative to bandpass filtering were compared and analyzed.

The Sinkiang Province area consists of mountains, rivers and desert. The majority of the twenty-one events were located in the mountainous region on the Soviet-China border; the location of the events is shown in Figure III-1 by code number as listed in Table III-1 which groups the events according to their distance to the three reference events. The table lists the event code number, the group number, the event name, the event latitude and longitude, the great circle distance and azimuth from array to event epicenter, the source depth, the body-wave magnitude and data source, the number of good sites used in array beamsteering, and the distance between test event and each reference event. The reference events (168, 170, 002) are underlined. Data sources were given by previous processing and reports, and are abbreviated as follows:

P = Preliminary Determination of Epicenter (P. D. E.)

L = Large Aperture Seismic Array (L. A. S. A.)

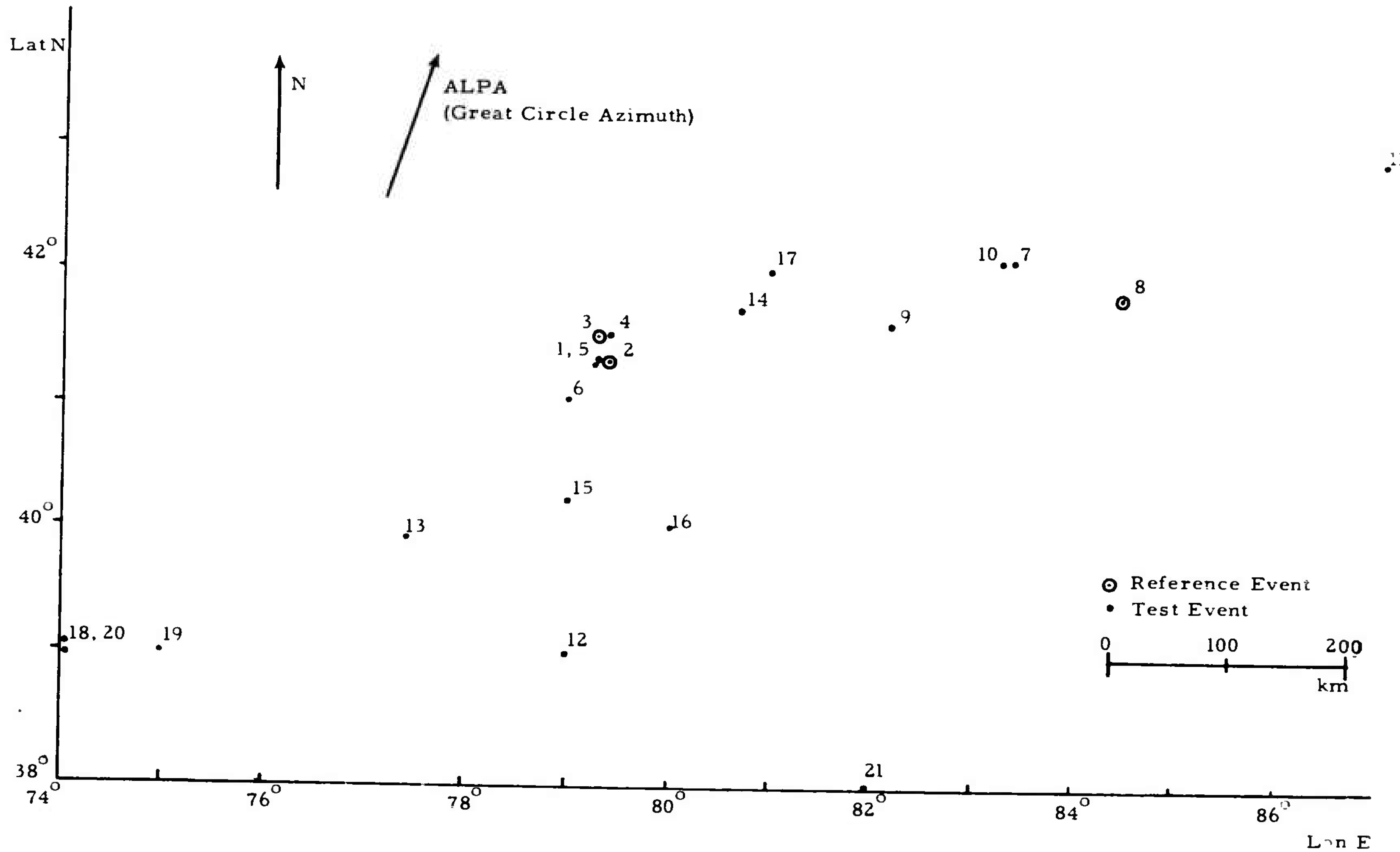

FIGURE III-1

LOCATION OF EVENTS, SINKIANG PROVINCE

TABLE III-1

COLLECTION OF SINKIANG PROVINCE EVENTS

Code Number	Group	Event Name	Location Lat N	Location Lon E	Δ°	Az°	D km	m_b and Data Source	No. Good Sites	Distance to Ref (km) 002	168	170
1	I	SIN/167/13AL	41.3	79.3	67.4	-36.6	33	5.1 P	4	436	8	22
2		SIN/168/15AL	41.3	79.4	67.3	-36.6	33	4.9 P	9	428	0	24
3		SIN/170/17AL	41.5	79.3	67.2	-36.5	33	5.2 P	10	433	24	0
4		SIN/170/21AL	41.5	79.4	67.2	-36.6	33	4.7 P	4	425	22	8
5		SIN*184*04AL	41.3	79.3	67.4	-36.6	17	4.9 P	14	436	8	22
6		SIN*281*09AL	41.0	79.0	67.7	-36.4	--	4.4 L	16	467	47	61
7	II	SIN*221*01AL	42.1	83.4	65.5	-39.4	33	4.2 P	12	97	344	346
8		SIN-002-10AL	41.8	84.5	65.5	-40.4	19	5.2 P	18	0	428	433
9		SIN-037-07AL	41.6	82.2	66.3	-38.7	33	4.7 P	14	192	236	241
10		SIN-064-08AL	42.1	83.3	65.6	-39.3	--	4.4 I	15	105	235	338
11		SIN-084-08QC	42.9	87.4	63.7	-42.1	33	5.0 P	13	268	683	684
12	III	SIN*181*13AL	39.0	79.0	69.6	-37.1	--	4.6	12	560	258	279
13		SIN-042-05QD	39.9	77.4	69.2	-35.6	23	4.9 P	8	633	230	234
14		SIN-047-23QC	41.7	80.7	66.6	-37.5	29	4.8 P	12	315	117	118
15		SIN-064-04AL	40.2	79.0	68.5	-36.9	--	4.5 I	15	494	127	147
16		SIN-080-21AL	40.0	80.0	68.4	-37.6	--	3.4 I	12	428	153	177
17		SIN-154-06AL	42.0	81.0	66.3	-37.6	--	3.9 N	15	290	154	151
18	IV	SIN/170/08AL	39.0	74.0	70.8	-33.2	--	4.2	7	941	525	528
19		SIN*194*02AL	39.0	75.1	70.6	-34.1	62	4.3	10	853	446	452
20		SIN-060-20AL	39.0	74.0	70.8	-33.2	33	4.0 M	12	941	525	528
21	V	SIN-076-21AL	38.0	82.0	69.8	-39.9	--	3.5 I	12	475	429	452

N = Norwegian Seismic Array (NORSAR)

I = International Seismic Bulletin (I. S. B.)

M = International Seismological Month (I. S. M.)

Blank = non-P. D. E., but otherwise not known

The test events of group I are within 61 km of the reference events refs. 168, 170; their distance to ref. 002 is about 450 km. The events in group II are closest to ref. 002; their distance to refs. 168, 170 varies from 236 to 684 km. The events of groups III and IV are all located closer to refs. 168, 170 than to ref. 002, but their distance to refs. 168, 170 is considerably greater than those of the group I events. For group III these distances are 117 to 279 km, for group IV the distances vary from 446 to 523 km. Group V is comprised by only one event having approximately equal distance to each of the three reference events.

B. REFERENCE EVENTS

To meet this study's objective we need a set of reference events with different locations and magnitudes, and with a sufficient signal-to-noise ratio. The following set of reference events satisfied these requirements:

ref. 002: SIN-002-10AL, $m_b = 5.2$

ref. 168: SIN/168/15AL, $m_b = 4.9$

ref. 170: SIN/170/17AL, $m_b = 5.2$.

Refs. 168 and 170 were located 24 km from each other and within 61 km from any event in group I (see Table III-1). Ref. 002 was located 430 km from refs. 168, 170 and within 270 km from any event in group II. The depths of refs. 168, 170 were 33 km, ref. 002 had 19 km depth. Because of the location and depth differences between refs. 168, 170 on the one hand and ref. 002 on the other, ref. 002 most likely had a source mechanism different from that of refs. 168, 170. The reference event bandpass signal traces are shown in the Figures III-2,

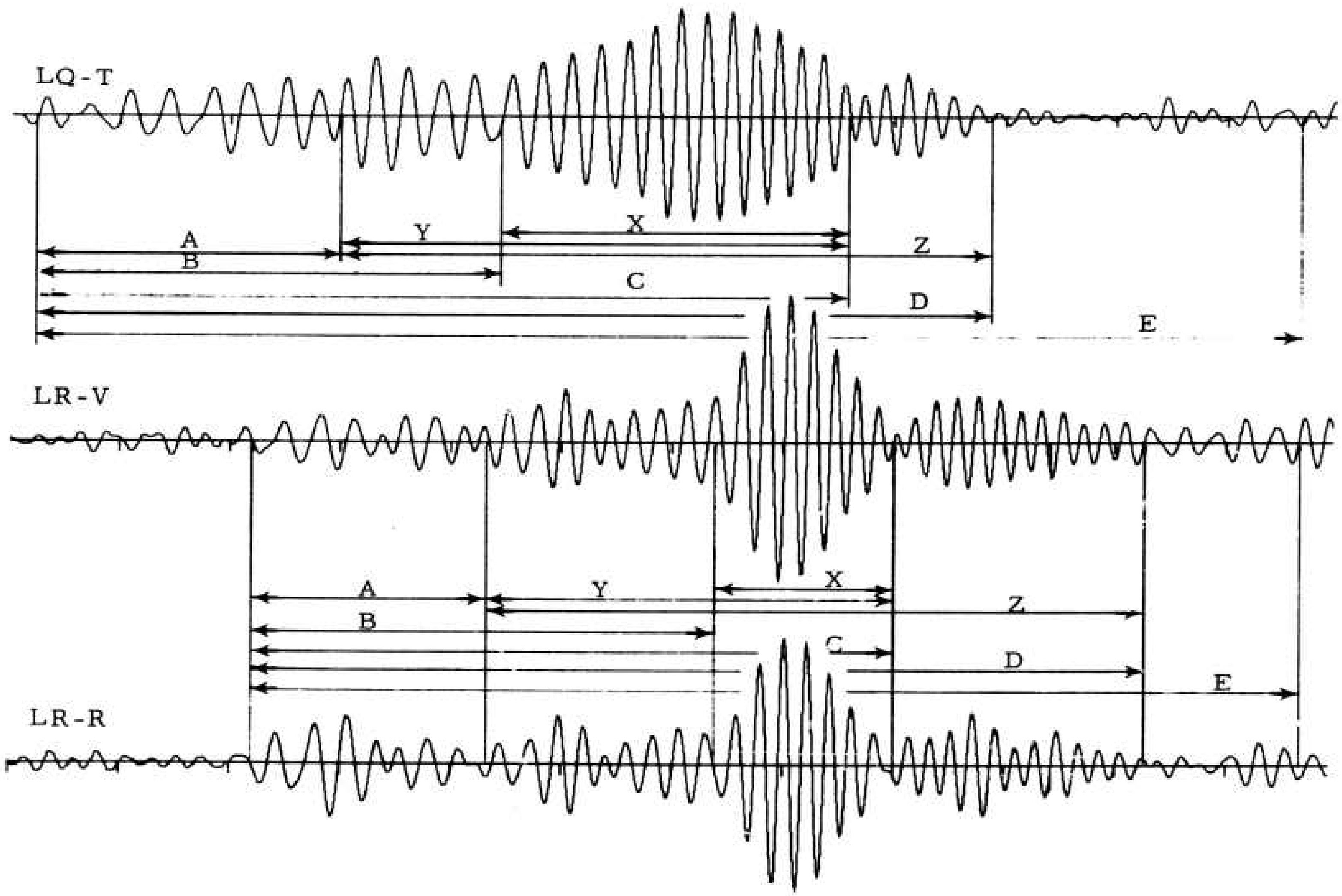

FIGURE III-2

REFERENCE WAVEFORM CHARACTERIZATION, REF. 002

III-3, III-4, which also illustrate the reference waveform lengths selected as described in the next subsection. The signals from ref. 163 and 170 are indeed similar in shape (although different in signal-to-noise ratio), while the ref. 002 signal is different in both, signal shape and signal-to-noise ratio.

C. REFERENCE WAVEFORMS

In order to search for the part of a reference event signal trace that will give maximum processing gain when used as a matched filter reference waveform, eight different, but overlapping, parts were selected from each reference event signal trace, for each of the beamsteered components. Despite the signal differences between the three reference events, the reference waveforms can be roughly characterized as follows, see Figures III-2, III-3, III-4:

length A: first significant wavetrain after arrival time
length B: A plus second wavetrain
length C: B plus third wavetrain
length D: C plus fourth wavetrain
length E: D plus remainder of signal arrival
length X: wavetrain containing maximum signal
length Y: X plus one adjacent wavetrain
length Z: X plus two adjacent wavetrains .

A wavetrain in this instance is considered a smoothly modulated signal portion between "nodes" or between significant phase changes. Because of the difference in signal shape of the three reference events the above characterization cannot be very rigid; for example type A of ref. 002 has different signal content and will perform differently than type A of ref. 170.

Because of dispersion, length A in general contains the low frequency, early arrival part of the signal. Lengths B, C, D and E include

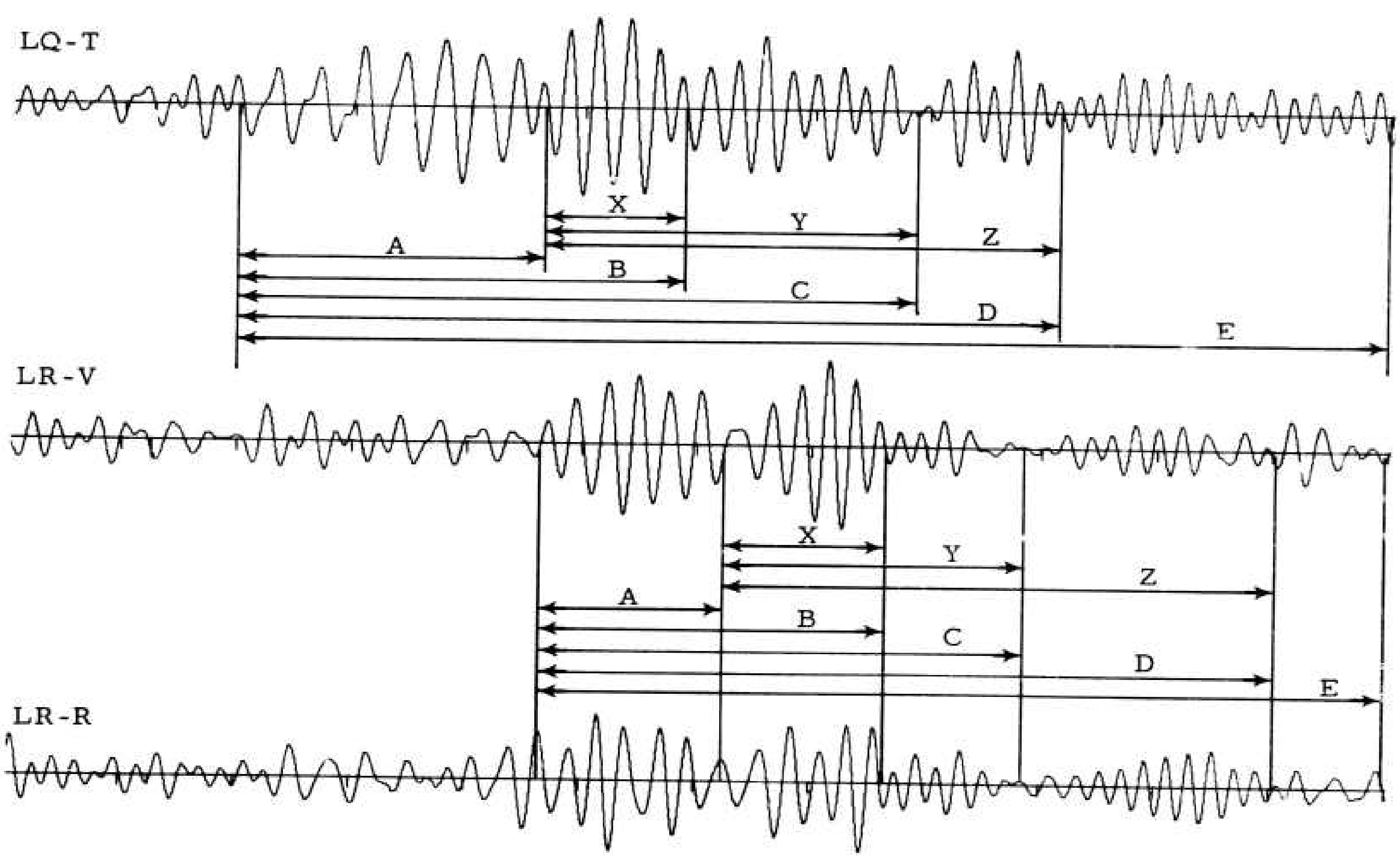

FIGURE III-3

REFERENCE WAVEFORM CHARACTERIZATION, REF. 168

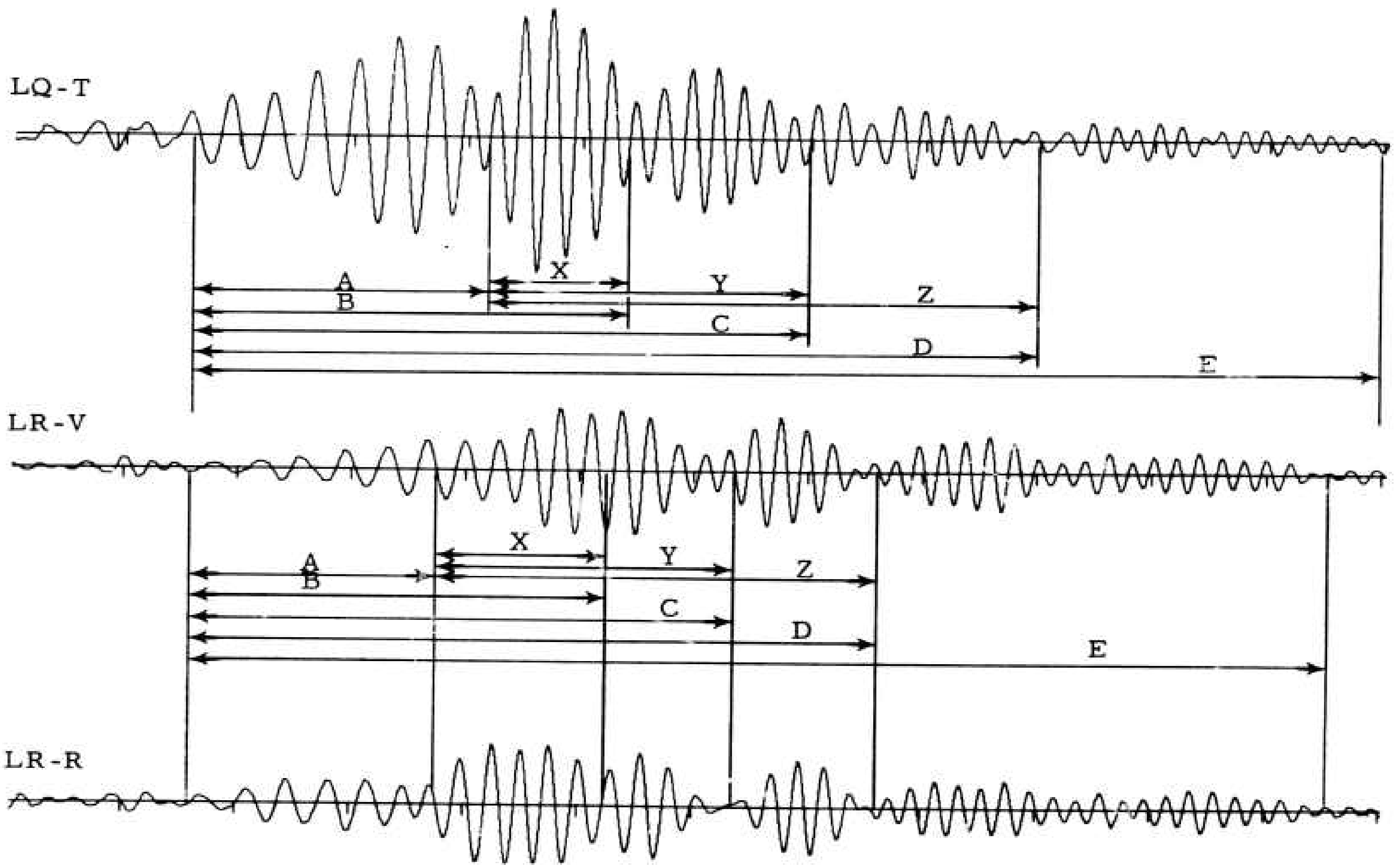

FIGURE III-4

REFERENCE WAVEFORM CHARACTERIZATION, REF. 170

increasingly higher frequencies and later arrivals, with length E containing the entire signal, including multiple arrivals. Length X is a short duration, center-frequency-band waveform containing the highest signal power; lengths Y and Z are extensions of the X waveform .

The interval specification of a reference waveform-Love wave component is independent of the Rayleigh-reference waveform specification. The two Rayleigh-reference waveform components are formed by identical interval specification.

D. DATA PROCESSING

1. Introduction

Most data processing was done with existing programs used in routine processing (Texas Instruments, 1972). These programs perform frequency domain rather than time domain filtering because greater speed is achieved with the use of fast Fourier transforms. The various processing steps are described briefly below.

2. Event Signals

All signals used in this study were previously edited for spike removal and for elimination of bad sites. The resulting signals were rotated to yield the transverse Love wave component (LQ-T), and the vertical and radial Rayleigh wave components (LR-V, LR-R). The array signals were obtained by beamsteering all available sites (Texas Instruments, 1972). Before matched filtering, the test event signals were filtered through the 0.025-0.55 Hz frequency band (40 to 18 seconds), the reference waveforms were not bandpassed.

3. Reference Waveform Matched Filtering

Reference waveform lengths were specified as described previously. Where necessary, the waveform was extended with zero values to obtain a box car window with a total of 2048 2-sec samples. This signal was Fourier transformed, and the complex conjugate taken. The use of other windows was not considered in this study.

Matched filtering was performed by taking the Fourier transform of the test event signal after extending it with zero values to 2048 2-sec samples, and multiplying the complex spectrum with the complex conjugate of the reference waveform spectrum. The result, the complex cross power spectrum, then was transformed back into the time domain to yield the matched filter output.

4. Signal-to-noise Ratio Computation

For long period array evaluation projects the true signal-to-noise ratio (SNR) is defined as the ratio between the maximum value of signal plus noise during the expected signal arrivals and the RMS noise value taken over a time gate just prior to the signal arrival (Texas Instruments, 1972). The SNR was computed automatically, however output traces obtained by CALCOMP plotting were used to check the results.

5. Processing Gain Computation

For each test event the SNR of the bandpass filter output is computed first, then the SNR is determined for each of the eight matched filter outputs per component, for each reference event. The SNR gain (GN) of matched filtering over bandpass filtering is obtained as the ratio of matched filter output SNR to the bandpass filter output SNR. Finally, the matched filter processing gain over bandpass filtering is expressed in decibels:

$$GDB = 20 \log_{10} GN.$$

SECTION IV
ANALYSIS

A. INTRODUCTION

This section presents and analyzes the data processing results for optimum reference event and optimum reference waveform characteristics. Detailed numerical results are presented in tabular form for each test event in Appendix A. The results of all test events are combined in the Figures IV-1, IV-2, IV-3 and in Table IV-1.

Figures IV-1, IV-2, IV-3 show the matched filter processing gains per component over bandpass filtering, obtained by the reference waveform lengths A, B, C, D, E, X, Y, Z, in that order, of each reference event as applied in processing the twenty-one test events. Table IV-1 presents the optimum gain over bandpass filtering, and indicates which are the optimum or near-optimum reference waveform lengths per component, for each reference event. To facilitate the analysis the most relevant parameters from Table II-1 are repeated, and the bandpass signal-to-noise ratios are included in the table. Gains of less than 2 dB are omitted in the optimization analysis.

In the analysis we will first search the results for the reference events that are optimum for some set of events. From each optimum reference event we then will try to find the optimum reference waveform characteristics. Finally, the relationships between the processing gain and the parameters distance, magnitude and signal-to-noise ratio are investigated, the optimum gains are compared with routine processing gains, and the matched filter behavior of the two Rayleigh wave components is discussed.

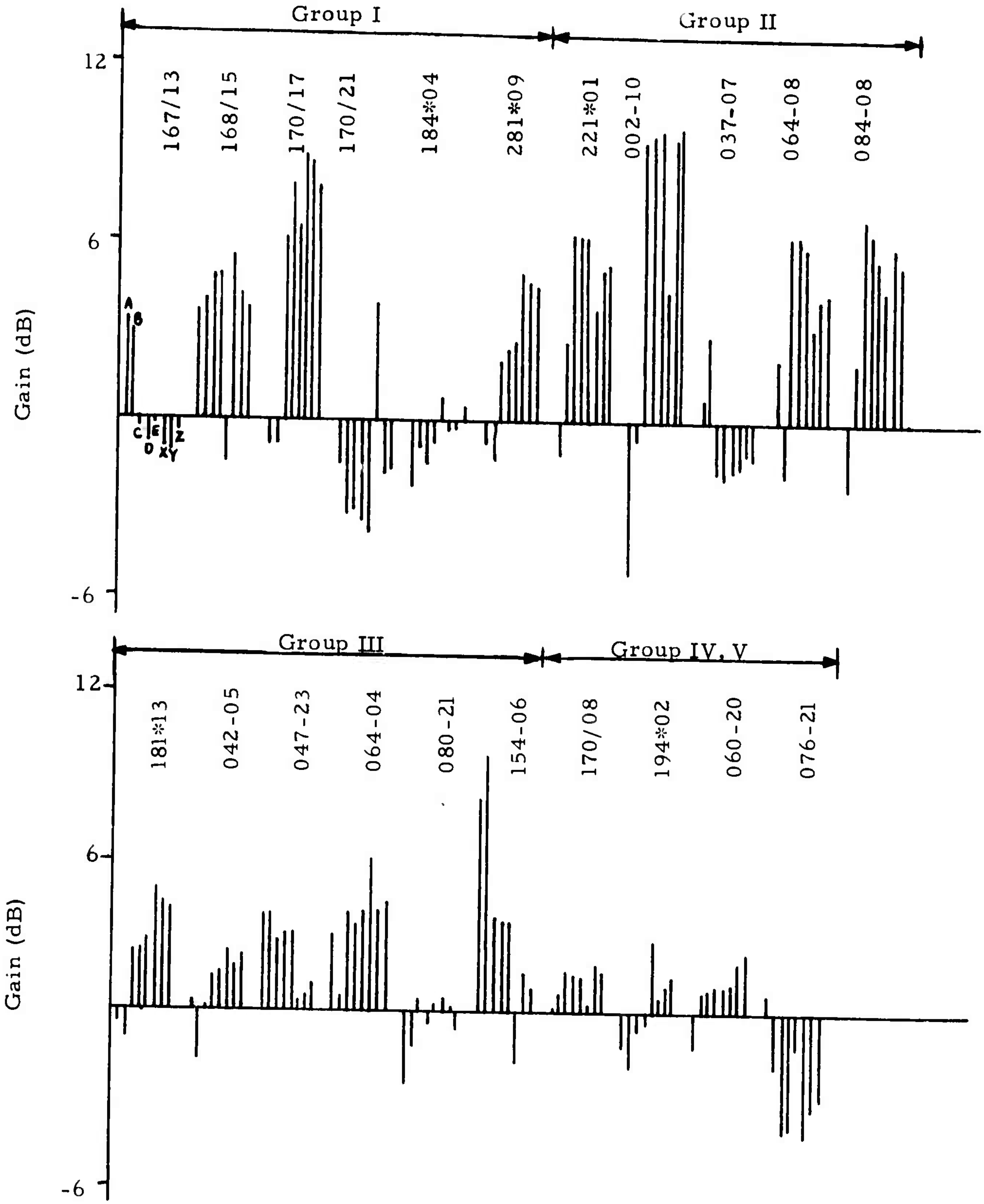

FIGURE IV-1-a

PROCESSING GAINS VERSUS REFERENCE WAVEFORM LENGTHS, REF. 002, LQ-T

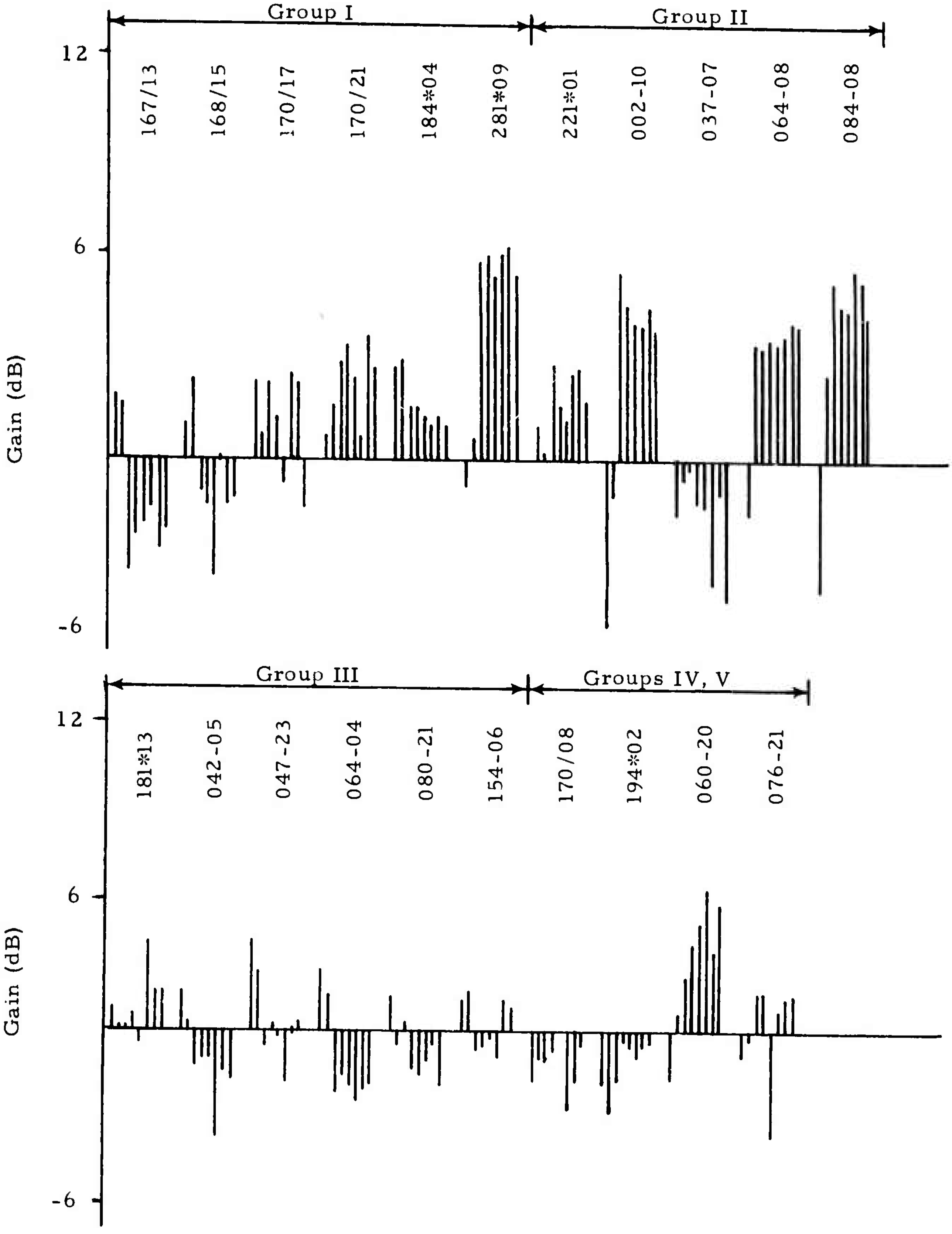

FIGURE IV-1-b

PROCESSING GAINS VERSUS REFERENCE WAVEFORM LENGTHS, REF. 002, LR-V

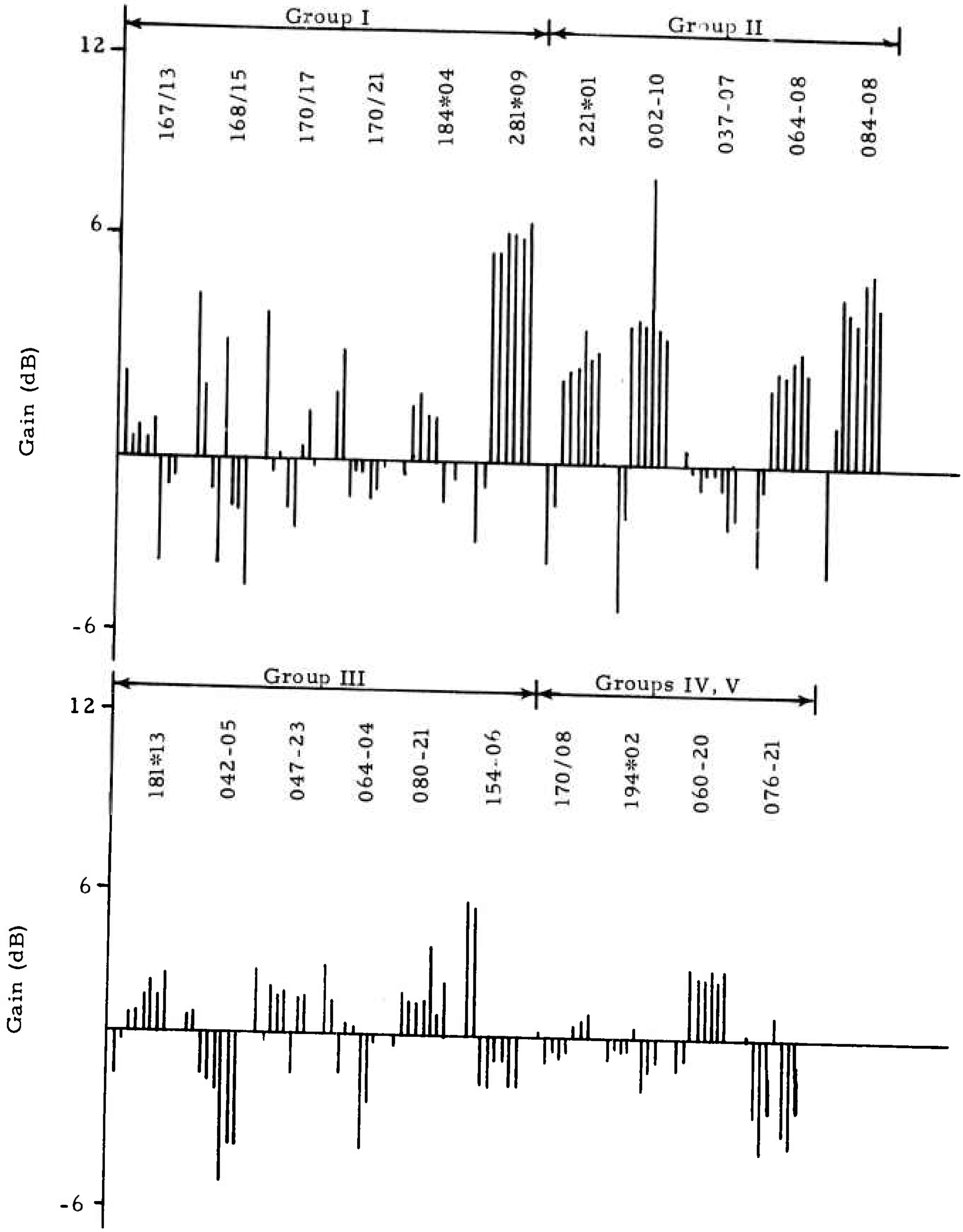

FIGURE IV-1-c

PROCESSING GAINS VERSUS REFERENCE WAVEFORM LENGTHS, REF. 002, LR-R

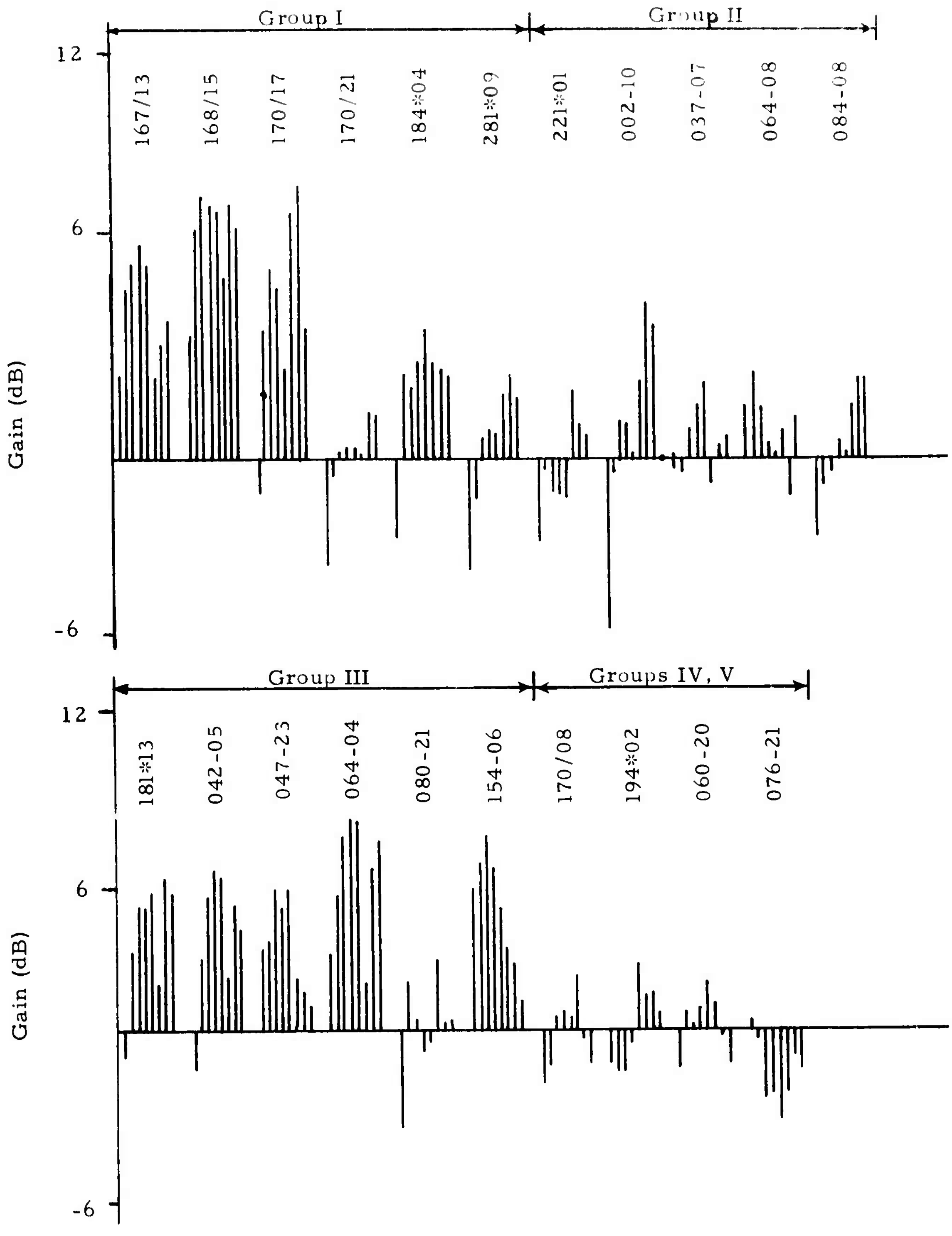

FIGURE IV-2-a

PROCESSING GAINS VERSUS REFERENCE WAVEFORM LENGTHS, REF. 168, LQ-T

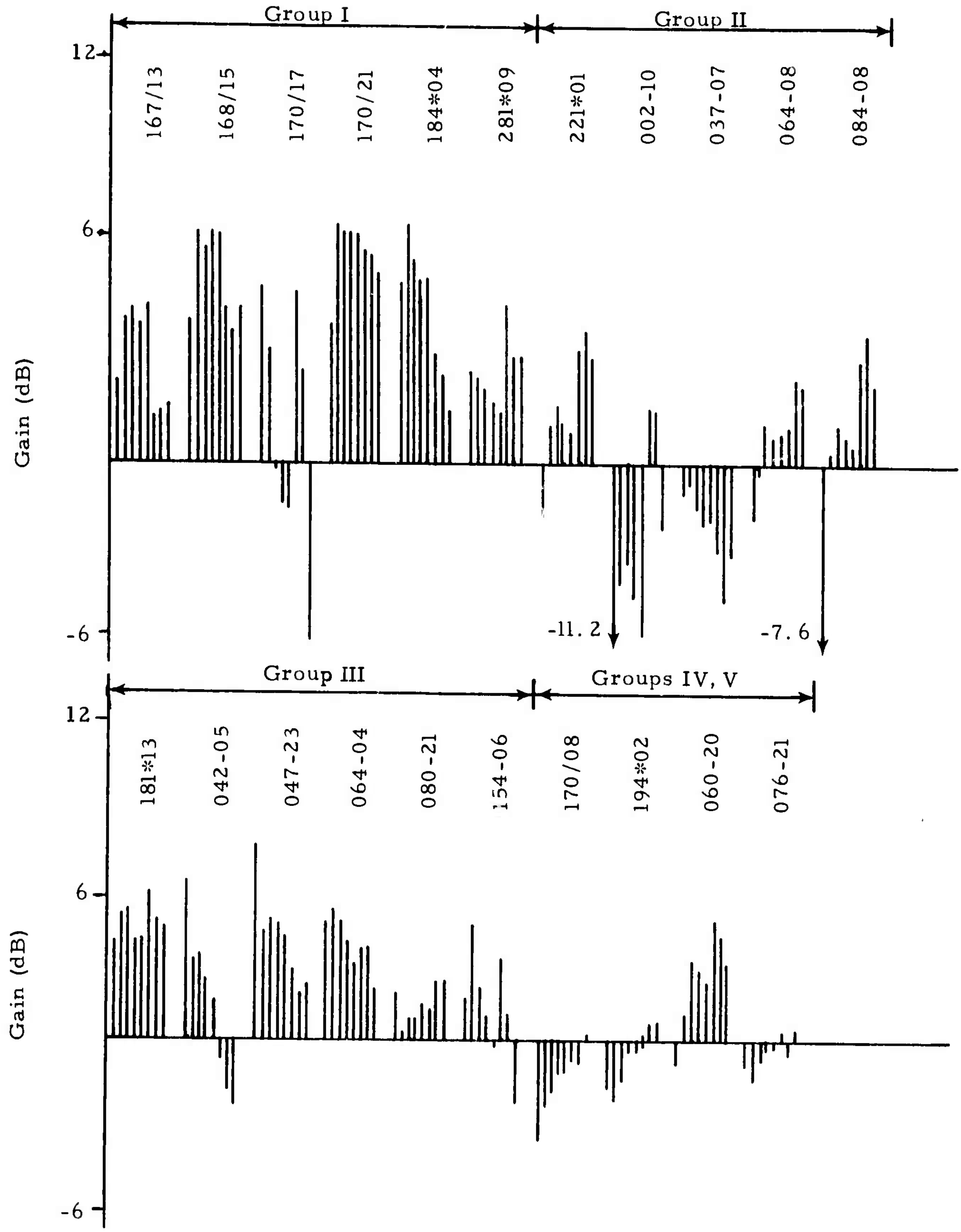

FIGURE IV-2-b

PROCESSING GAINS VERSUS REFERENCE WAVEFORM LENGTHS, REF. 168, LR-V

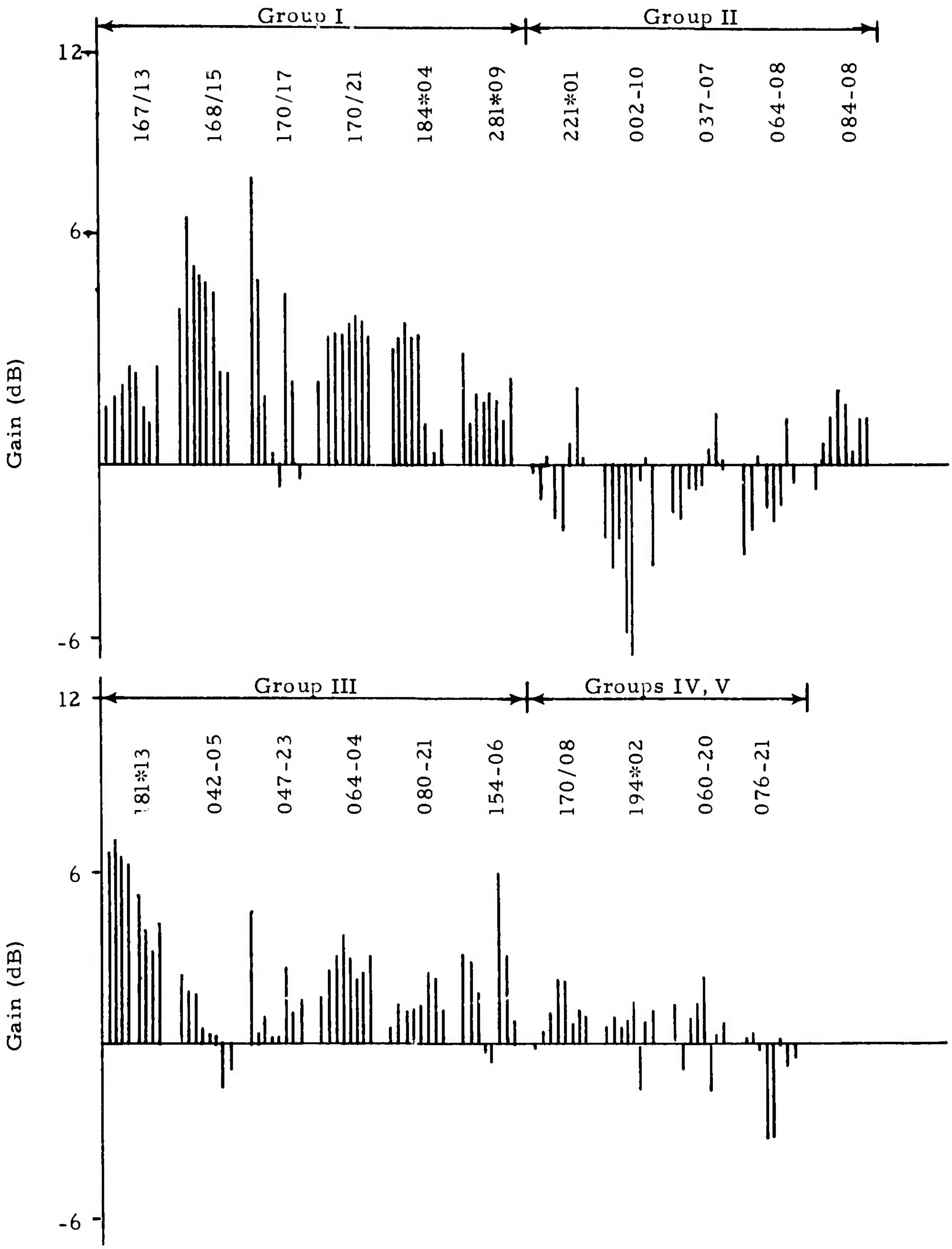

FIGURE IV-2-c

PROCESSING GAINS VERSUS REFERENCE WAVEFORM LENGTHS, REF. 168, LR-R

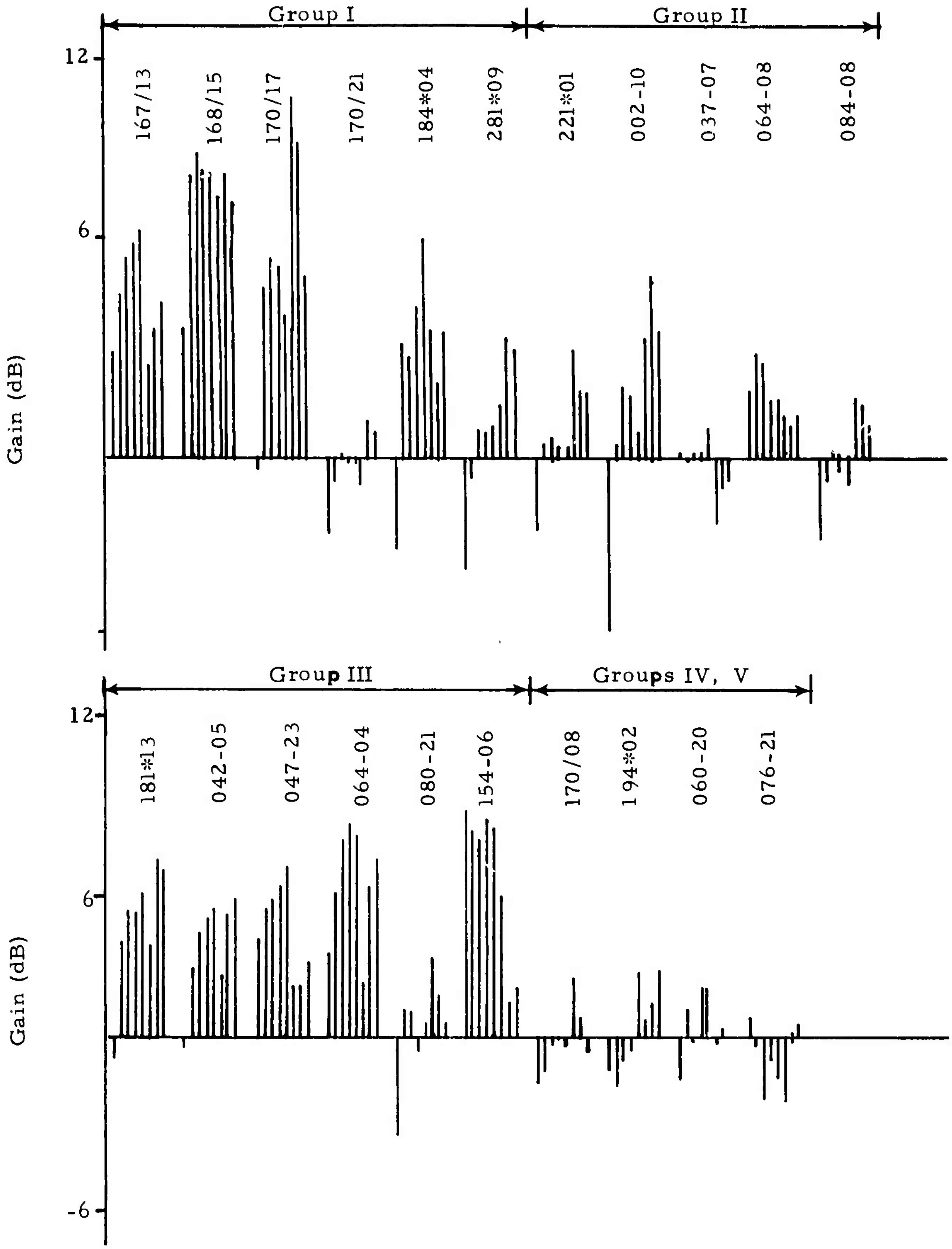

FIGURE IV-3-a

PROCESSING GAINS VERSUS REFERENCE WAVEFORM LENGTHS, REF. 170, LQ-T

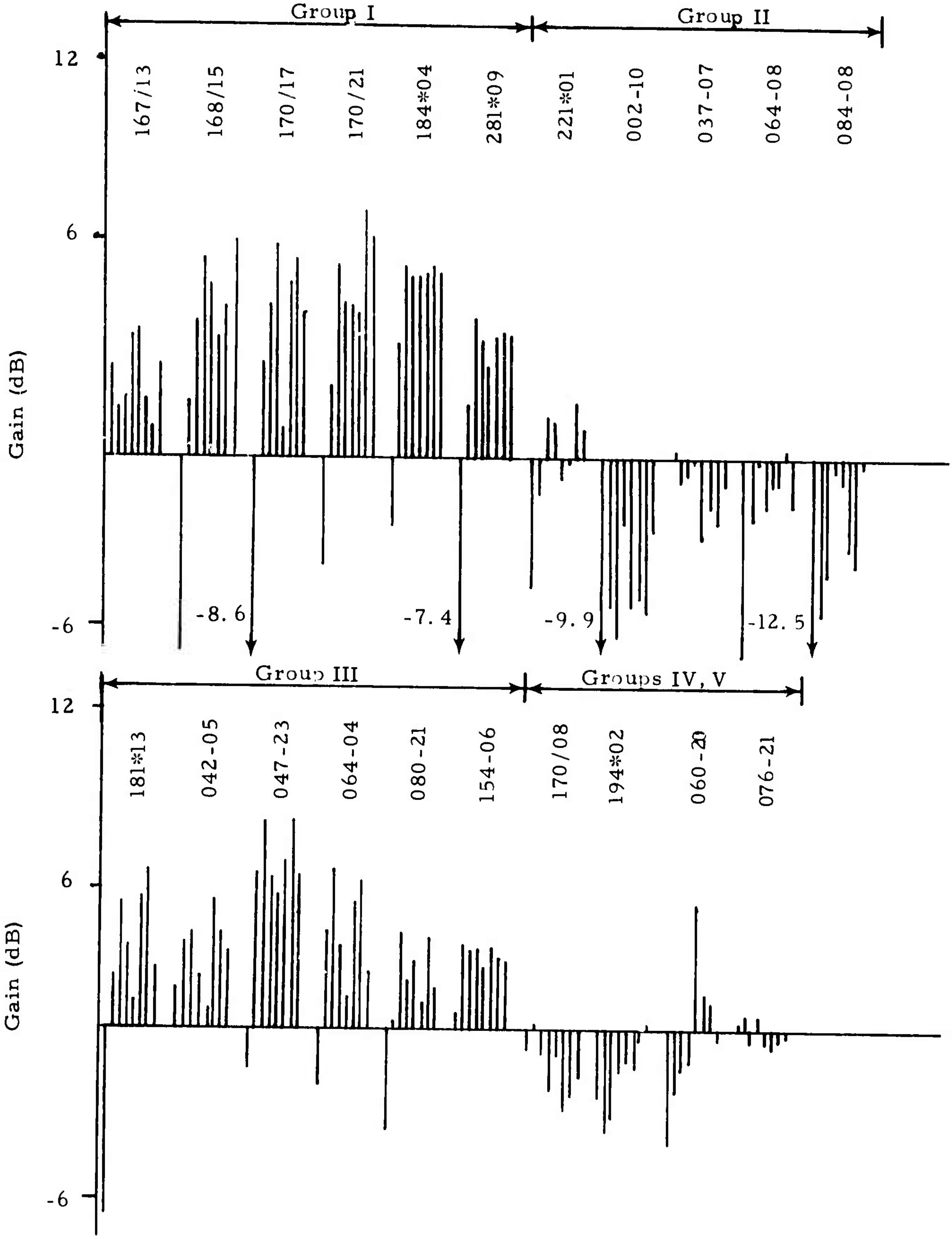

FIGURE IV-3-b

PROCESSING GAINS VERSUS REFERENCE WAVEFORM LENGTHS, REF. 170, LR-V

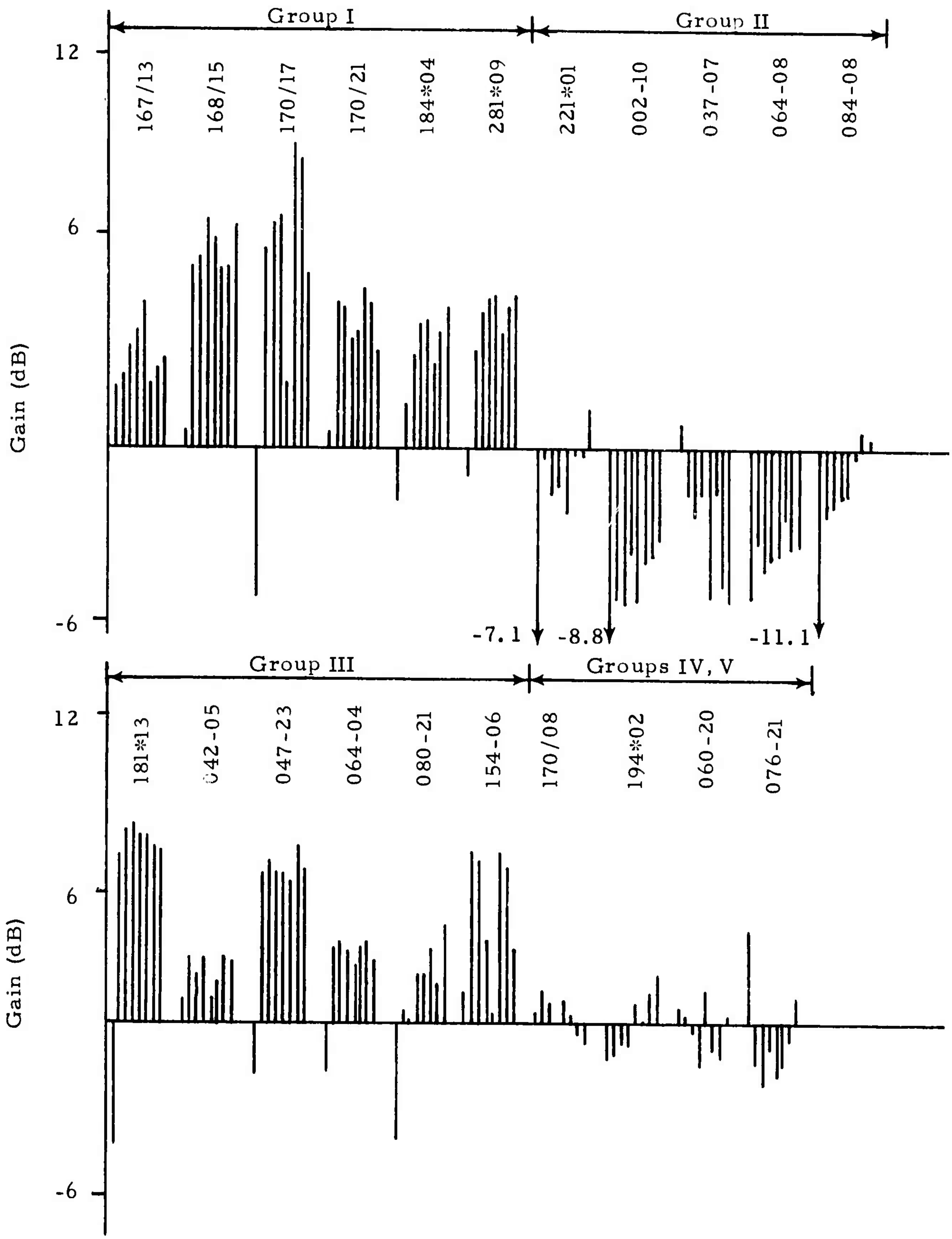

FIGURE IV-3-c

PROCESSING GAINS VERSUS REFERENCE WAVEFORM LENGTHS, REF. 170, LR-R

TABLE IV-1

MAXIMUM PROCESSING GAINS OVER BANDPASS FILTERING
(PAGE 1 OF 2)

Code No.	Gp	Event	m_b	D km	Distance to Ref. (km)			BP SNR			Max GDB, Ref. 002					
											LQ-T		LR-V		LR-R	
					002	168	170	LQ-T	LR-V	LR-R	dB	Length	dB	Length	dB	Length
1		167/13	5.1	33	436	8	22	11.1	11.6	9.0	3.3	AB	2.1	AB	2.8	A
2		168/15	4.9	33	428	0	24	8.1	8.3	7.1	5.5	ABCD XYZ	2.7	B	5.8	A E
3	I	170/17	5.2	33	433	24	0	109.6	133.6	97.1	8.9	D XYZ	2.9	A C XY	5.1	A
4		170/21	4.7	33	425	22	8	4.7	10.6	8.2	3.8	X	4.2	CDE YZ	3.9	AB
5		184*04	4.9	17	436	8	22	12.8	11.1	9.9	0.6	-----	3.4	AB	2.3	BC
6		281*09	4.4	-	467	47	61	4.4	2.8	5.0	5.0	XYZ	7.9	CDEXYZ	8.3	CD XYZ
7		221*01	4.2	33	97	344	346	4.2	6.1	10.4	6.3	CDE YZ	3.3	C XY	4.1	CD XYZ
8	II	002-10	5.2	19	0	428	433	22.2	31.7	31.6	9.9	CDE YZ	6.5	CDEXYZ	10.0	X
9		037-07	4.7	33	192	236	241	2.6	3.9	2.8	2.8	B	NEG	-----	0.5	-----
10		064-08	4.4	-	105	335	338	7.6	14.3	12.0	6.2	CDE	4.6	BCDEXYZ	3.8	CD XYZ
11		084-08	5.0	33	268	683	684	19.6	39.1	30.0	6.8	CDE YZ	6.6	CDEXYZ	6.6	CD XYZ
12		181*13	4.6	-	560	258	279	5.5	11.0	5.7	4.2	XYZ	3.1	X	2.1	X Z
13		042-05	4.9	23	633	230	239	25.7	40.3	47.7	2.0	EXYZ	1.4	-----	0.7	-----
14	III	047-23	4.8	29	315	117	118	6.0	17.2	12.6	3.2	ABCDE	3.2	AB	2.2	A
15		064-04	4.5	-	494	127	147	9.0	18.2	12.7	5.1	C XYZ	2.2	A	2.5	A
16		080-21	3.4	-	428	153	177	3.5	4.0	4.1	0.4	-----	1.2	-----	3.1	X
17		154-06	3.9	-	290	154	151	8.0	4.5	4.5	8.6	AB	1.4	-----	4.7	AB
18		170/08	4.2	-	941	525	528	2.7	2.9	2.9	1.7	-----	0.0	-----	0.9	-----
19	IV	194*02	4.3	62	853	446	452	2.3	2.8	1.9	2.4	E	NEG	-----	0.4	-----
20		060-20	4.0	33	941	525	528	3.0	2.6	2.7	2.0	YZ	5.0	X Z	2.5	CD XYZ
21	V	076-21	3.5	-	473	429	452	3.8	2.8	3.3	0.6	-----	1.3	-----	0.9	-----

TABLE IV-1

MAXIMUM PROCESSING GAINS OVER BANDPASS FILTERING
(PAGE 2 OF 2)

Code No.	Gp	Event	Max GDB, Ref. 168						Max GDB, Ref. 170					
			LQ-T		LR-V		LR-R		LQ-T		LR-V		LR-R	
			dB	Length	dB	Length	dB	Length	dB	Length	dB	Length	dB	Length
1		167/13	7.4	BCDE	5.3	BCDE	3.4	ABCDE	7.9	CDE	4.3	A DE Z	4.9	CDE Z
2		168/15	9.2	BCDE YZ	8.0	BCDE	8.4	BCDE	10.6	CDE Y	7.5	CD Z	7.5	BCDEXYZ
3	I	170/17	9.5	XY	6.0	A X	9.9	A	12.2	XY	7.3	D XY	10.5	XY
4		170/21	1.6	-----	8.1	BCDEXYZ	5.1	BCDEXYZ	1.2	-----	8.5	C YZ	5.4	BCDEXY
5		184*04	4.5	BCDEXYZ	8.1	XYZ	4.8	ABCDE	7.6	E	6.7	CDEXYZ	4.9	CDE YZ
6		281*09	2.8	XYZ	5.4	XYZ	3.9	A CDEXYZ	4.1	YZ	4.8	CDEXYZ	5.5	CDEXYZ
7		221*01	2.3	X	4.5	XYZ	2.7	Y	3.7	XYZ	1.8	-----	1.3	-----
8	II	002-10	5.4	YZ	1.9	-----	0.1	-----	6.3	XYZ	NEG	-----	NEG	-----
9		037-07	2.6	DE	NEG	-----	1.8	-----	1.0	-----	0.2	-----	NEG	-----
10		064-08	3.0	ABC	2.9	YZ	1.6	-----	3.5	ABCDE	0.2	-----	NEG	-----
11		084-08	2.8	XYZ	4.4	XYZ	2.7	DE	2.0	XY	NEG	-----	0.5	-----
12		181*13	5.4	CDE YZ	5.1	ABCDEXYZ	7.1	ABCD	6.2	CDE YZ	5.6	C XY	6.9	BCDEXYZ
13		042-05	5.6	CDE Y	5.5	A	2.4	ABC	4.8	CDE YZ	4.5	BCD YZ	2.3	BCD YZ
14		047-23	5.0	CDE	6.7	A	4.6	A X	5.9	BCDE	7.2	BCD XYZ	6.1	BCDEXYZ
15	III	064-04	7.4	CDE YZ	4.5	ABCDEXY	3.8	BCDEXYZ	7.3	CDE YZ	5.6	C XY	2.8	BCDEXYZ
16		080-21	2.4	B X	2.1	A YZ	2.5	XY	2.7	X	3.4	C E Y	3.4	XYZ
17		154-06	6.9	ABCD	4.0	B X	5.8	X	7.8	ABCDE	3.0	BCDEXYZ	6.0	BC XY
18		170/08	1.9	-----	0.1	-----	2.2	DE	2.0	X	0.0	-----	1.1	-----
19	IV	194*02	2.4	E	0.6	-----	1.5	-----	2.2	E Z	0.1	-----	1.7	-----
20		060-20	1.7	-----	4.1	CD XYZ	2.3	E	1.7	-----	4.4	X	1.2	-----
21	V	076-21	0.4	-----	0.2	-----	0.3	-----	0.7	-----	0.5	-----	3.1	A

B. OPTIMUM REFERENCE EVENTS

In the search for optimum reference events we scan the results in Table IV-1 and Figures IV-1, IV-2, IV-3. Starting with the relatively small area containing the events of group I, we see that for most events either ref. 168 or ref. 170 yields maximum processing gain. The exceptions are event 281*09 which correlates better with ref. 002 for all three components, and event 170/21 for which the transverse component matches better with a ref. 002 waveform. The only differences between event 281*09 and the other group I events are its lower magnitude and its 20 to 35 km larger distance to refs. 168, 170; it may also have a different depth. The transverse component of event 170/21 is lacking in high frequency energy and so its signal does not match well with the refs. 168, 170 waveforms. The Rayleigh wave components of this event correlate well with these reference waveforms. Gain differences between ref. 168 and ref. 170 in general are less than 1.5 dB.

For most group II events, all located closer to ref. 002 than to refs. 168, 170, the optimum event is ref. 002. One exception is the low signal-to-noise ratio event 037-07 which shows an overall low or even negative gain compared with bandpass filtering. The second exception is the vertical component of event 221*01, showing a 1.2 dB better match with ref. 168 waveforms. (The radial component is 1.4 dB better for ref. 002, and so the Rayleigh wave gains are comparable for the two reference waveforms.)

For the group III events, located closer to refs. 168, 170 than to ref. 002, either ref. 168 or ref. 170 constitutes the optimum reference event, with less than 1.5 dB gain differences. Only the transverse component of event 154-06 shows a slightly better correlation (0.8 dB) with ref. 002.

The matched filtering performance of the events in groups IV and V is too poor to be considered in the optimization analysis; these events are all more than 400 km from any reference event.

Thus, we may conclude that distance seems the most important factor in selecting a reference event, and in general it should be chosen closest to the events to be processed. Even within a relatively small area, however, an event may occasionally correlate better with a reference event located at a much greater distance. Such cases seem unpredictable. Furthermore, reference events in approximately the same location, but of different magnitude, seem to perform equivalently, which would be expected provided the reference events were relatively large.

C. OPTIMUM REFERENCE WAVEFORMS

Once an optimum reference event is established one must determine the part of its signal trace which constitutes a reference waveform that yields maximum matched filter processing gain. If for each optimum reference event the optimum waveform length is similar, we have established an optimum length reference waveform. If we find different reference waveform lengths, we may be able to establish some characteristics which facilitate the selection of optimum waveforms.

To pursue the above objective we again scan Table IV-1 and Figures IV-1, IV-2, IV-3, and focus on the reference waveform types yielding optimum or near-optimum matched filter processing gain. Near-optimum gain in this instance means a gain that is within 2 dB of the maximum gain. Since the transverse component reference waveform is defined independently from the two Rayleigh wave component reference waveforms their optimum waveform lengths may differ. The two Rayleigh wave reference waveforms, however, must be considered simultaneously, since they are defined by the same time interval specification.

In the previous subsection it was shown that for the events of groups I and III combined, with the exception of event 281*09 and the transverse component of event 170/21, either ref. 168 or ref. 170 constitutes

the optimum reference event. Disregarding these exceptions we will now investigate if for either reference event there is a reference waveform length that is commonly optimum for all events of this set. Thus, for transverse component processing, we consider the ten events 167/13, 168/15, 170/17, 184*04, 181*13, 042-05, 047-23, 064-04, 080-21, 154-06. For Rayleigh wave processing we consider the same events plus event 170/21, a total of eleven events. When considering ref. 168 processing we exclude the processing results for ref. 168 matched to itself. Similarly, we omit ref. 170 matched to itself. Thus, for transverse component processing we have a total of nine events to consider, for Rayleigh wave processing this total is ten events.

In ref. 168 transverse component processing we find that the waveforms C and D are a common optimum for the seven events 167/13, 184*04, 181*13, 042-05, 047-23, 064-04, 154-06; the waveform X is the only common optimum for the events 170/17 and 080-21. Thus, optimum transverse component processing using ref. 168 requires at least two different reference waveform lengths for this set of nine events. In ref. 168 Rayleigh wave processing the waveforms B, C and D are a common optimum for the events 167/13, 170/21, 184*04, 181*13, 064-04; waveform A is the common optimum for 170/17, 042-05, 047-23; Y is optimum for 080-21 and X for 154-06. Thus, optimum Rayleigh wave processing using ref. 168 requires four different reference waveform lengths for this set of ten events.

In ref. 170 transverse component processing waveform E is the common optimum for the eight events 167/13, 168/15, 184*04, 181*13, 042-05, 047-23, 064-04, 154-06; X is the optimum waveform for 080-21. Thus, ref. 170 transverse component optimum processing requires two different reference waveform lengths. In ref. 170 Rayleigh wave processing the waveform C is a common optimum for the eight events 168/15, 170/21, 184*04, 181*13, 042-05, 047-23, 064-04, 156-04; waveform E is optimum for 167/13 and 080-21. Another possible combination satisfying optimum processing for this entire

set of events is the waveform pair Y, D. Thus, ref. 170 Rayleigh wave optimum processing requires two different reference wave form lengths. In this respect, ref. 170 may be preferred over ref. 168 as the optimum reference event for this set of events.

Turning now to ref. 002, the optimum reference event for the five events 281*09, 221*01, 064-08, 084-08 and 060-20, we find that waveforms C, D, E are optimum for transverse component processing of the events 221*01, 064-08, 084-08 and waveforms Y and Z are optimum for 281*09 and 060-20. In Rayleigh wave processing, the waveform X is the common optimum for all five events. Thus ref. 002 transverse component processing requires two different lengths, Rayleigh wave optimum processing requires only one reference waveform length for this set of five events. Again we have excluded results of matching ref. 002 with itself.

In most cases optimum processing requires that at least two different reference waveform lengths be generated from each reference event signal trace. The variation in optimum waveform lengths indicates that no general statement about the optimum duration or signal content of a reference waveform can be made. However, examination of the frequency of occurrence that a certain type reference waveform is an optimum, indicates that some types have a higher probability of success than do others. In ref. 168 transverse component processing, types C and D are most frequently optimum, for ref. 168 Rayleigh wave processing the most frequent optimum waveform lengths are A, B, C, D. For ref. 170 transverse component processing, lengths C and D are best, for ref. 170 Rayleigh wave processing, C and Y give the best results. For ref. 002 transverse component processing, C, D, E, Y, Z are best, and for ref. 002 Rayleigh wave processing C, X, Y prevail. This indicates that in general the waveform containing most of the signal bandwidth and little or no multipath arrivals, such as length C, may have the greatest probability of being the optimum reference waveform for a

given reference event. Optimum processing over a number of events, however, requires several additional reference waveform lengths per reference event. There does not appear to be a straightforward way to anticipate the additional types of reference waveform required.

In the above analysis waveforms yielding a gain that is within 2 dB of the maximum gain are called near-optimum and compared on an equal basis to find the optimum waveform common to a number of events. Relaxing this criterion, for instance to 3 dB, will tend to reduce the number of waveforms required; restricting the criterion tends to increase this number. Obviously, there is a trade-off between the desired level of optimization, and the number of reference waveforms that such optimization requires.

D. COMPARISON OF OPTIMUM AND ROUTINE PROCESSING GAINS

The optimum Sinkiang Province processing gains obtained in this study were compared with reported routine processing gains (Texas Instruments, 1972, 1973). In routine reference waveform matched filtering normally a single high-magnitude event is chosen as a reference event for a relatively large region, and a part of its signal trace which by visual examination is determined to contain most of the signal bandwidth is taken as the reference waveform. In routine chirp waveform matched filtering chirp lengths are chosen based on distance, region and previous processing experience. The optimum gains in this study were obtained from results of matched filtering using a large number of different-length reference waveforms generated from reference events at different locations in the area concerned.

Table IV-2 compares the optimum gains with the ALPA reference matched filter routine processing gains for events processed in both manners; Table IV-3 shows the comparison with ALPA routine chirp waveform matched filter gains. Table IV-4 presents a comparison of the

TABLE IV-2

ALPA ROUTINE REFERENCE WAVEFORM PROCESSING
VS. OPTIMUM PROCESSING GAINS (dB)

Event	Routine Sinkiang RMF Processing			Optimum Sinkiang RMF Processing			Optimum Minus Routine Processing		
	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
281*09	ND	5.4	3.4	5.0	7.9	8.3	5.0	2.5	4.9
184*04	4.0	7.9	6.2	7.6	8.1	4.9	3.6	0.2	-1.3
221*01	0.0	-3.6	-0.6	6.3	4.5	4.1	6.3	8.1	4.7
154-06	5.2	3.3	0.7	8.6	4.0	6.0	3.4	0.7	0.5
Average Improvement							4.8	2.9	2.2

RMF = Reference Waveform Matched Filtering

ND = No Detection

TABLE IV-3

ALPA ROUTINE CHIRP WAVEFORM PROCESSING
VS. OPTIMUM PROCESSING GAINS (dB)

Event	Routine Sinkiang CMF Processing			Optimum Sinkiang RMF Processing			Optimum Minus Routine Processing		
	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
281*09	ND	3.8	4.2	5.0	7.9	8.3	5.0	4.1	4.1
184*04	-0.6	5.1	2.6	7.6	8.1	4.9	8.2	3.0	2.3
221*01	2.4	-0.6	-0.8	6.3	4.5	4.1	3.9	5.1	4.9
170/17	3.2	5.5	2.9	9.5	6.0	9.9	6.3	0.5	7.0
170/21	-2.3	3.4	4.7	3.8	8.5	5.4	6.1	5.1	0.7
168/15	4.7	1.7	1.5	10.6	7.5	1.5	5.9	5.8	6.0
167/13	2.2	2.1	3.0	7.9	5.3	4.9	5.7	3.2	1.9
Average Improvement							5.1	3.7	3.7

RMF = Reference Waveform Matched Filtering

CMF = Chirp Waveform Matched Filtering

ND = No Detection

TABLE IV-4

CENTRAL ASIA EVENTS AVERAGE ROUTINE PROCESSING GAINS VERSUS SINKIANG PROVINCE AVERAGE OPTIMUM PROCESSING GAINS (dB)

Processing	Number of Central Asia Events*			Routine Central Asia Processing			Optimum Sinkiang Processing			Optimum Minus Routine Processing		
	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
ALPA RMF	24	23	23	1.7	1.6	1.7	6.1	5.2	5.2	4.4	3.6	3.5
ALPA CMF	25	26	25	1.1	2.3	1.8	6.1	5.2	5.2	5.0	2.9	3.4
NORSAR CMF	25	21	20	1.7	1.9	2.0	6.1	5.2	5.2	4.4	3.3	3.1
Average Improvement										4.6	3.3	3.3

* Number of Sinkiang Events = 16

RMF = Reference Waveform Matched Filtering

CMF = Chirp Waveform Matched Filtering

average optimum gain of groups I, II and III events (excluding the reference event 002-10) with the average ALPA reference waveform matched filter, ALPA chirp waveform matched filter, and NORSAR chirp waveform matched filter processing gains for Central Asia events in the Sinkiang Province and neighboring regions (Sinkiang, Tadzhik, Hindu Kush, Tibet, China, Kirgiz, Tsinghai, Kashmir-Tibet Border, Afghanistan, Afghanistan-U. S. S. R. Border). NORSAR reference waveform matched filtering results were not available for Central Asia events.

The optimum processing method shows up to 8 dB gain improvements over routine processing. These improvements are obtained, however, at the expense of generating a large number of different reference waveforms. Routine optimum processing, therefore, would require either laborious, or highly automated processing.

E. PROCESSING GAIN VERSUS MAGNITUDE, SIGNAL-TO-NOISE RATIO AND DISTANCE

To complete the optimum reference waveform analysis we like to investigate the influence of magnitude, signal-to-noise ratio and distance on the matched filtering processing gain. These relations are shown in Figures IV-4 through IV-12, per component, for each reference event.

Figures IV-4, IV-5, IV-6 plot the matched filter processing gain over bandpass filtering versus event magnitude, Figures IV-7, IV-8, IV-9 versus event bandpass signal-to-noise ratio, and Figures IV-10, IV-11, IV-12 versus distance between test event and reference event. Encircled data points denote processing gains from events for which the reference event concerned is optimum. For example, the gains of most group I and III events are encircled on the graphs pertaining to refs. 168 and 170; most group II events are encircled on the graphs for ref. 002.

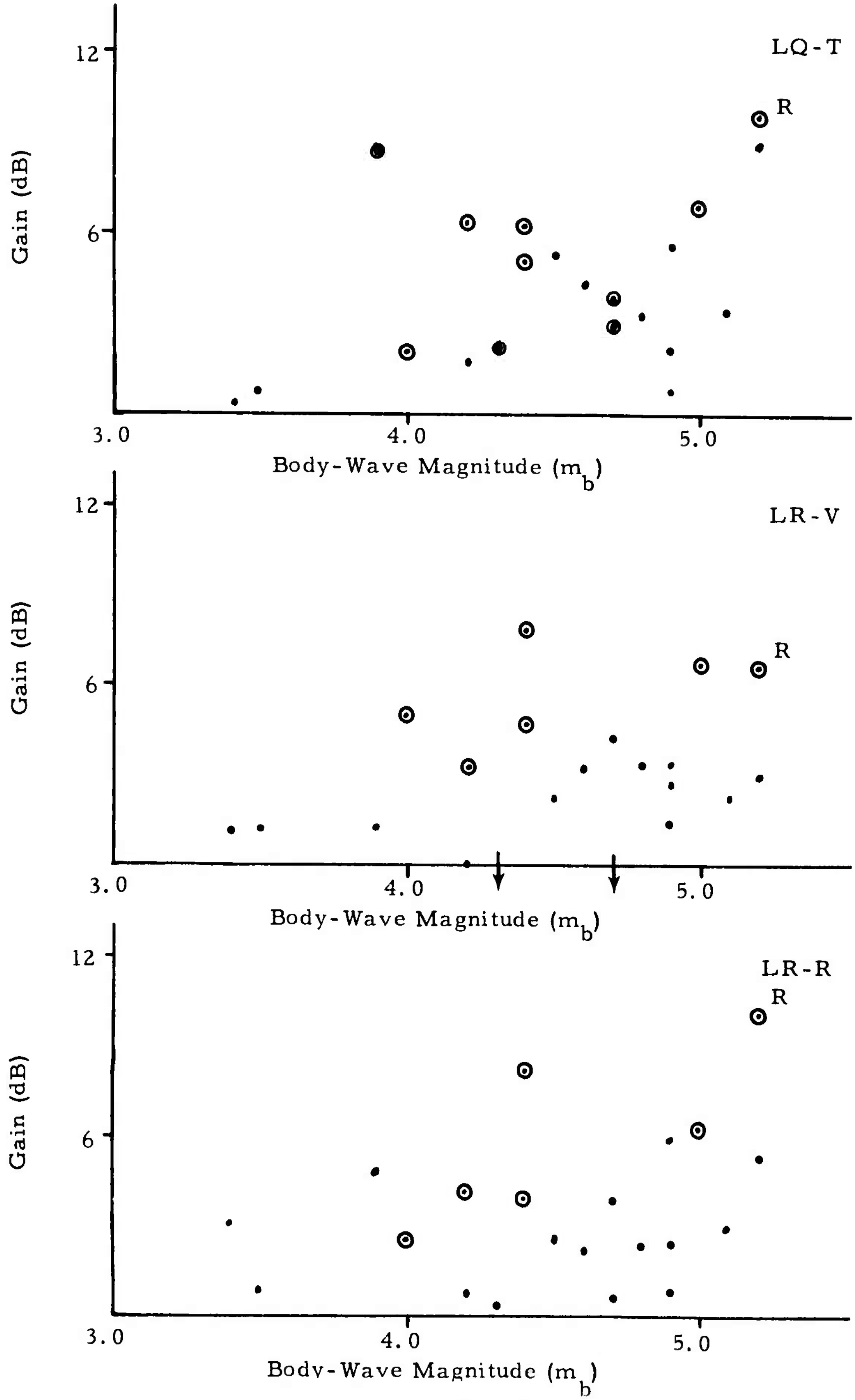

FIGURE IV-4

OPTIMUM GAIN VERSUS BODY-WAVE MAGNITUDE, REF. 002

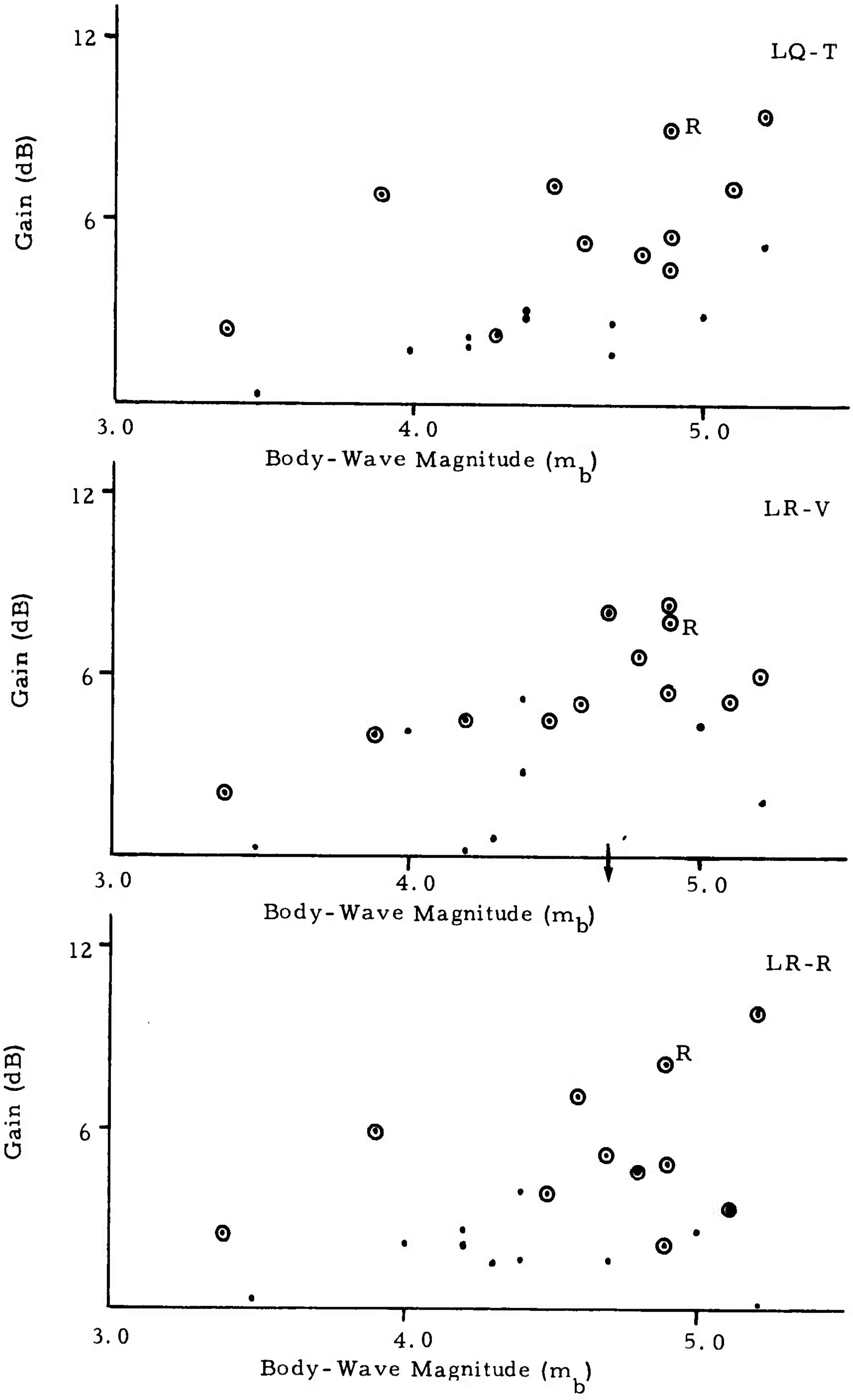

FIGURE IV-5

OPTIMUM GAIN VERSUS BODY-WAVE MAGNITUDE, REF. 168

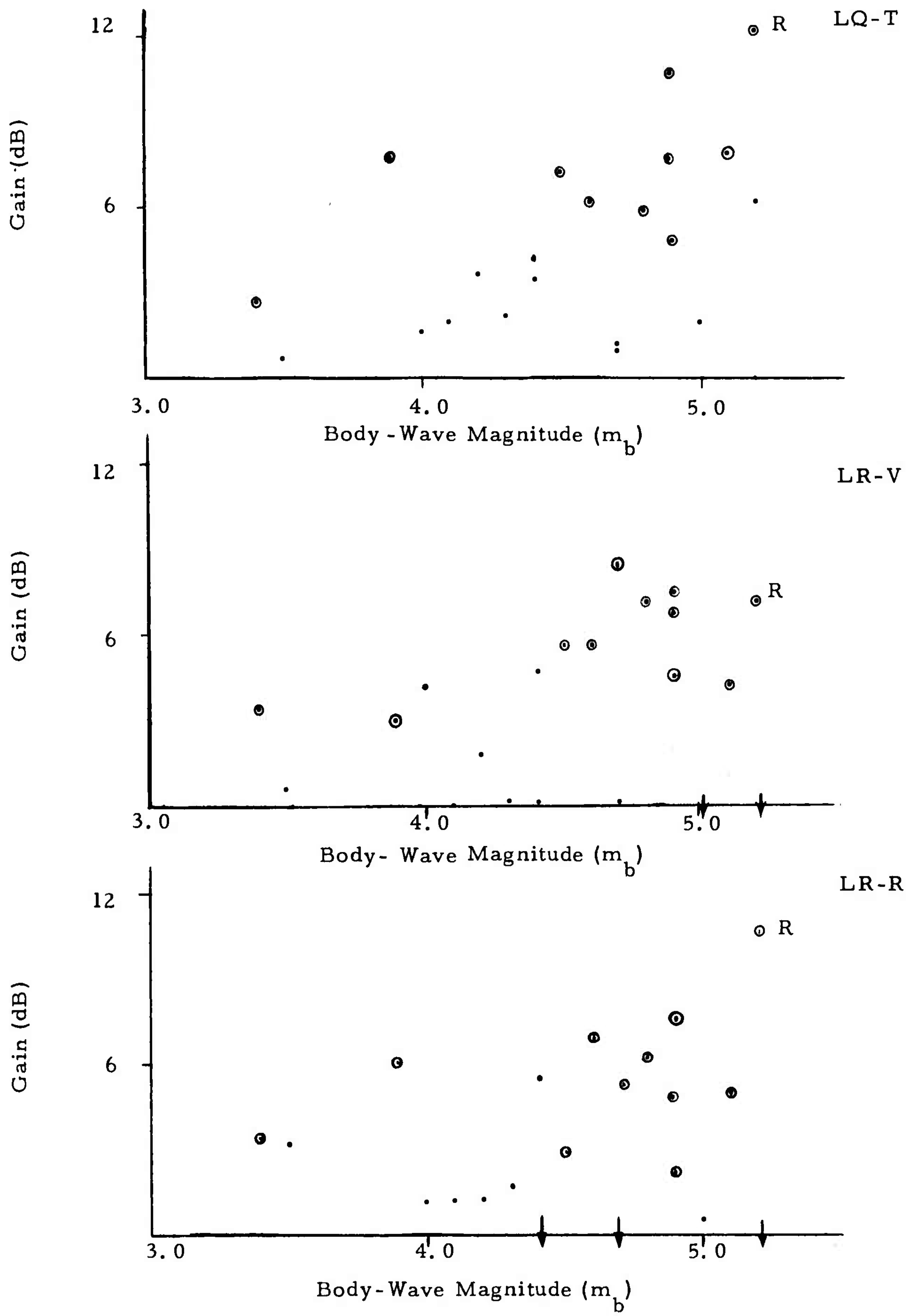

FIGURE IV-6

OPTIMUM GAIN VERSUS BODY-WAVE MAGNITUDE, REF. 170

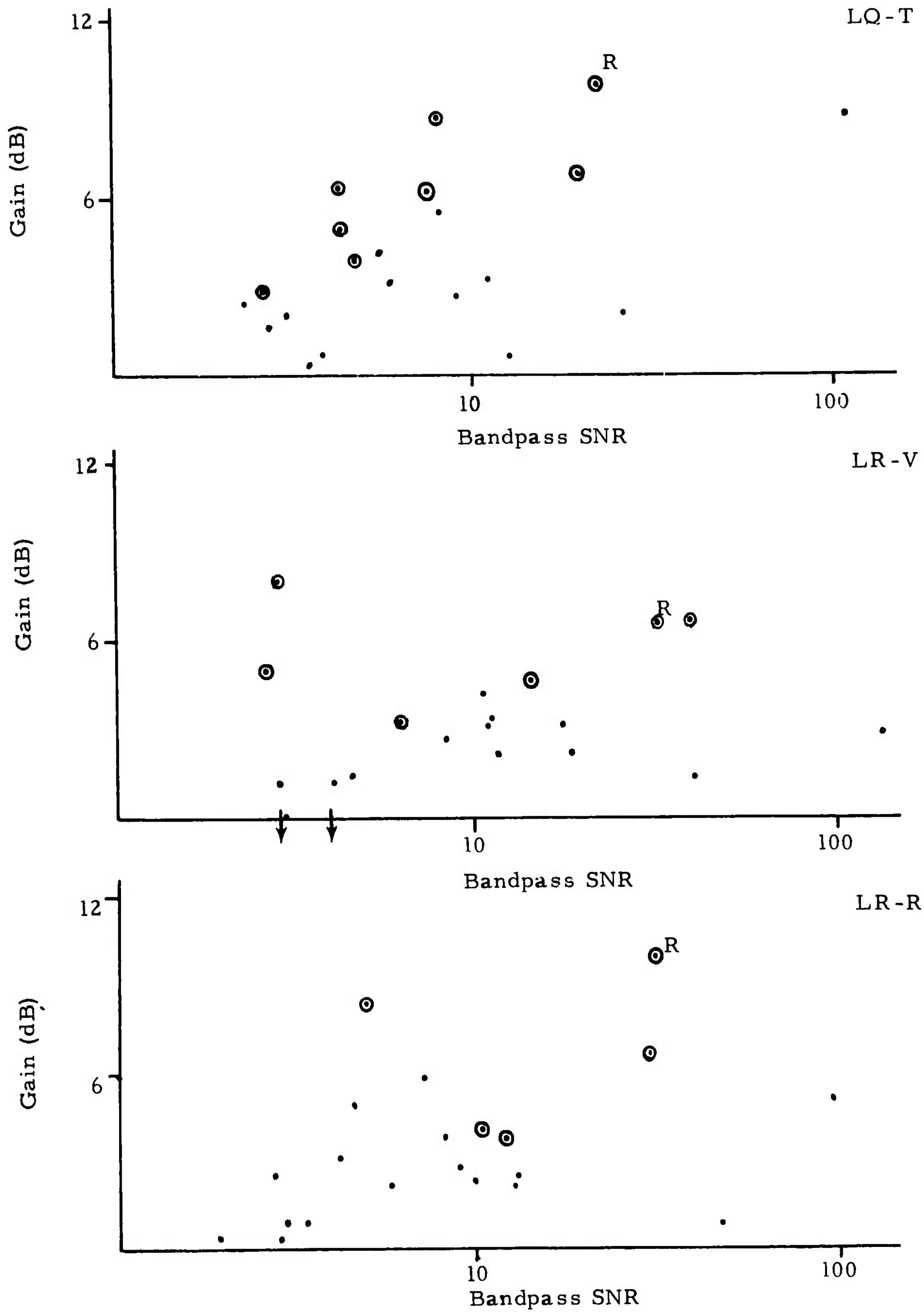

FIGURE IV-7

OPTIMUM GAIN VERSUS BANDPASS SNR, REF. 002

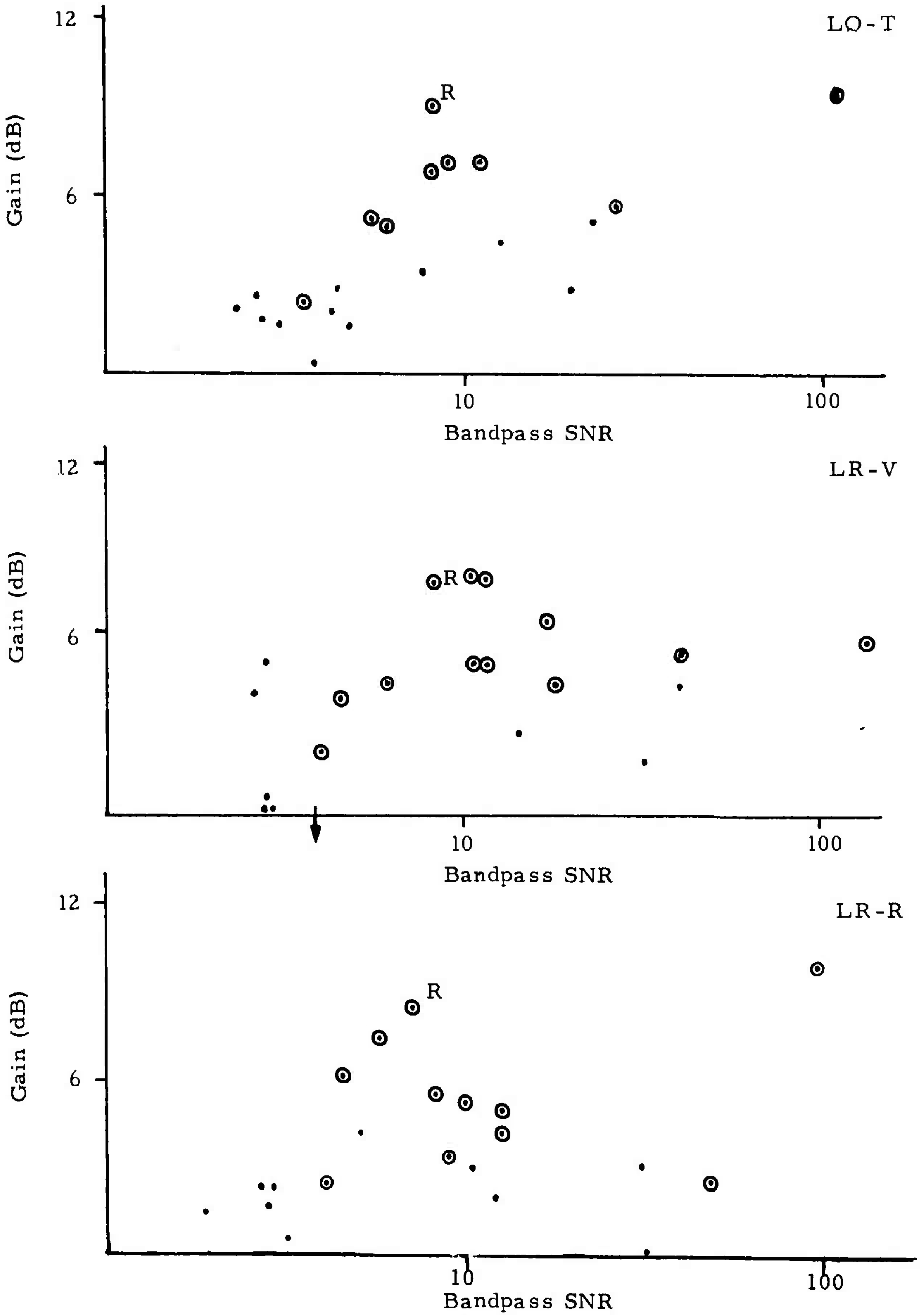

FIGURE IV-8

OPTIMUM GAIN VERSUS BANDPASS SNR, REF. 168

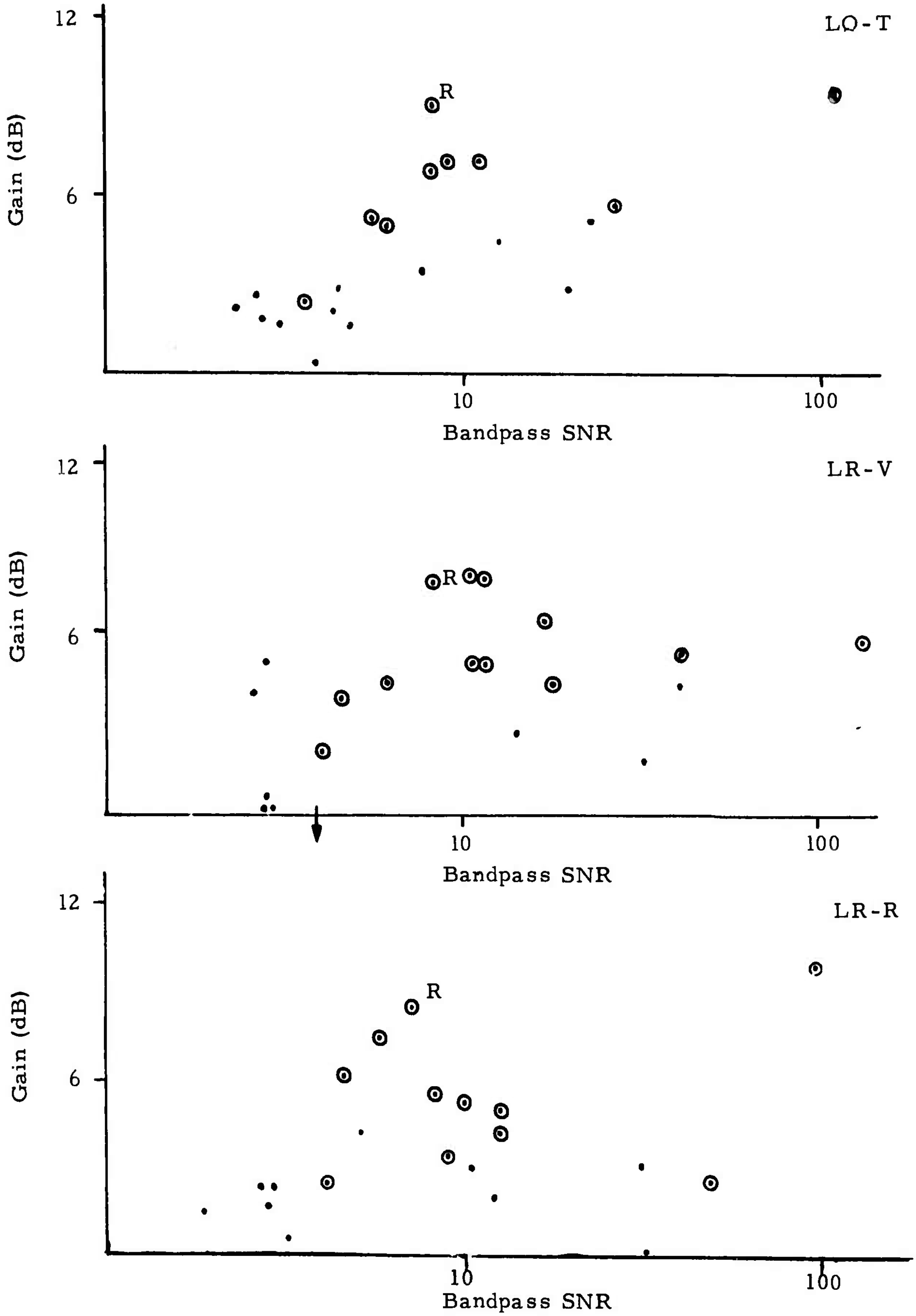

FIGURE IV-8

OPTIMUM GAIN VERSUS BANDPASS SNR, REF. 168

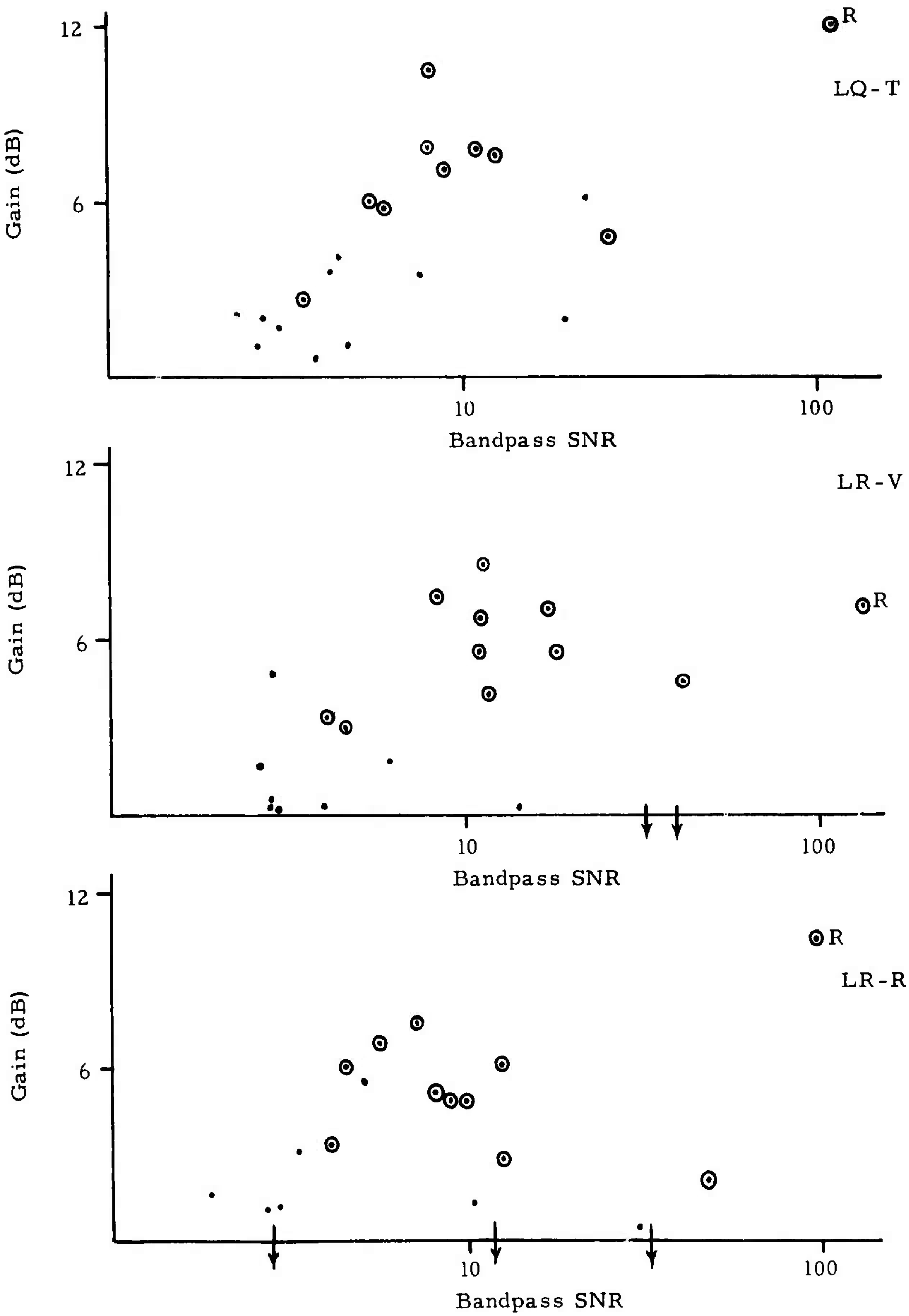

FIGURE IV-9

OPTIMUM GAIN VERSUS BANDPASS SNR, REF. 170

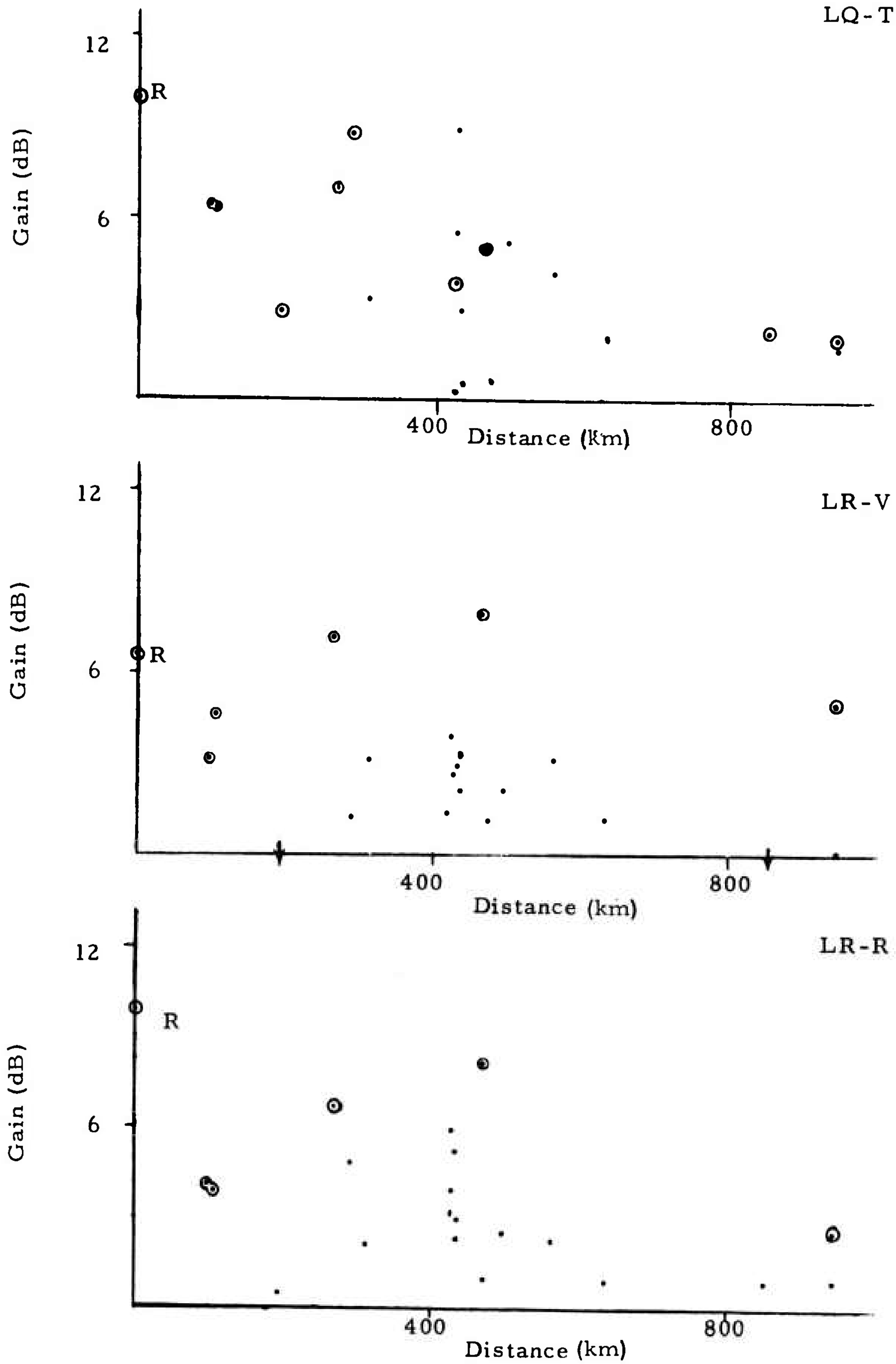

FIGURE IV-10

OPTIMUM GAIN VERSUS DISTANCE, REF. 002

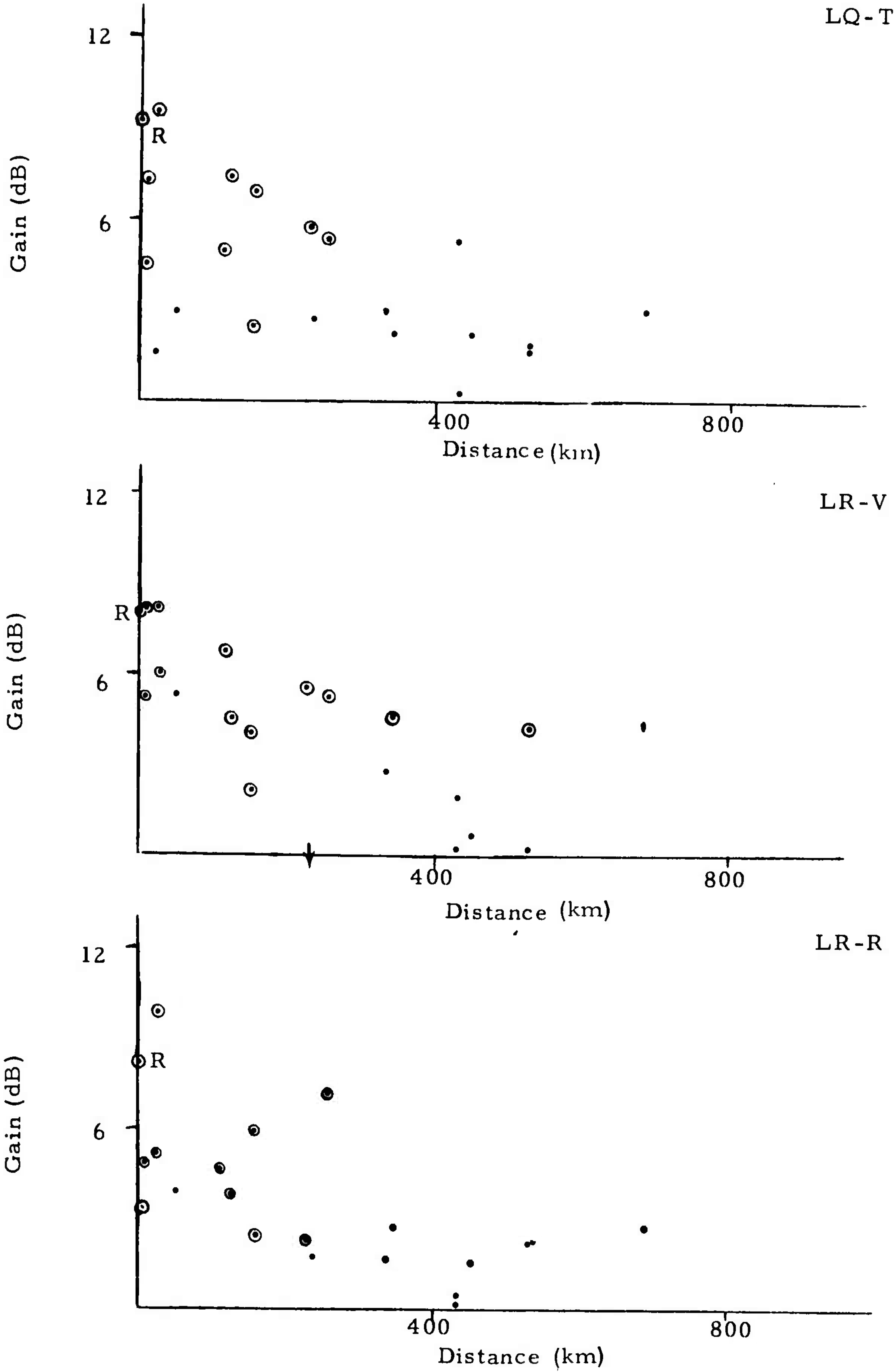

FIGURE IV-11

OPTIMUM GAIN VERSUS DISTANCE, REF. 168

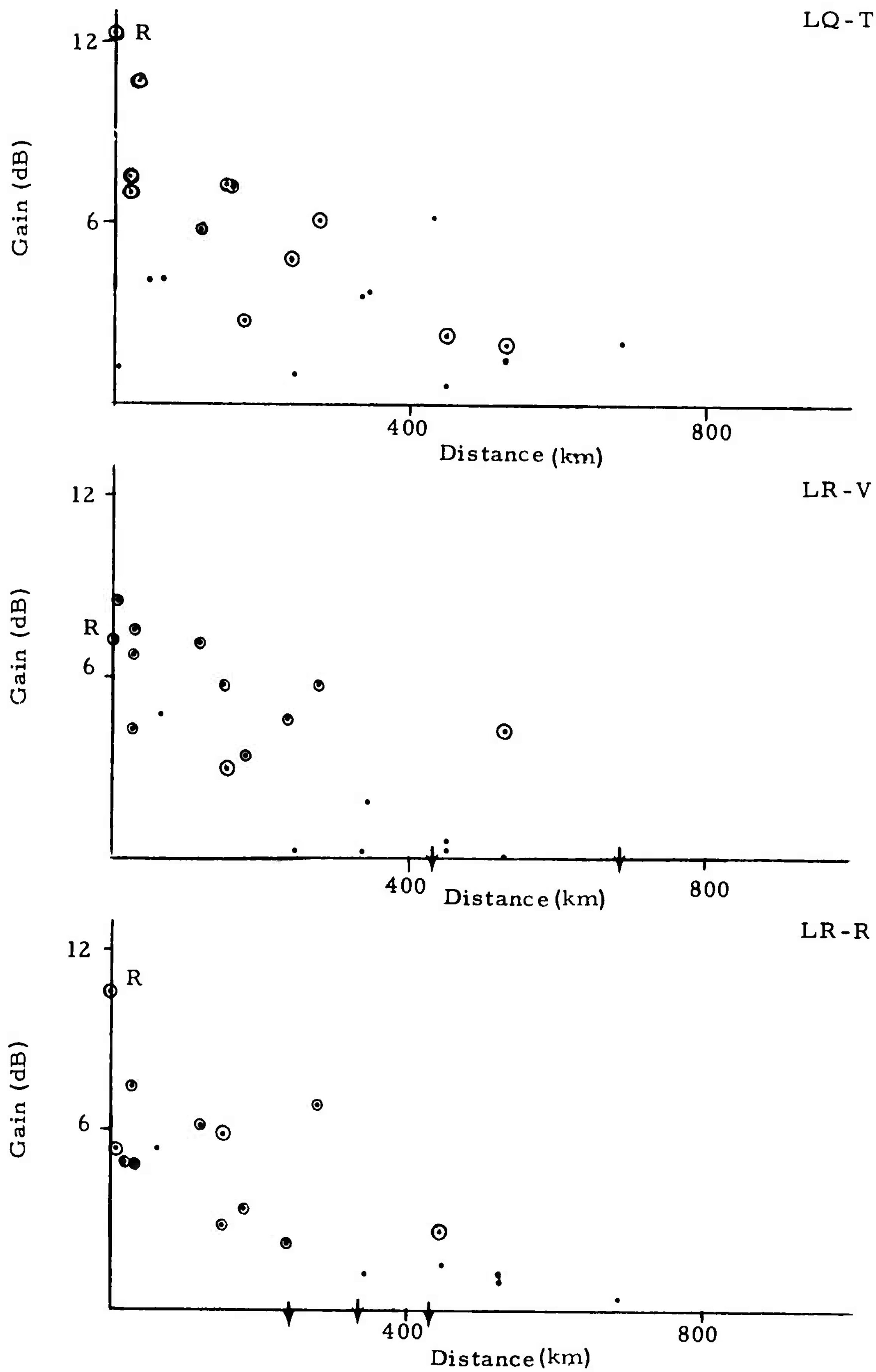

FIGURE IV-12

OPTIMUM GAIN VERSUS DISTANCE, REF. 170

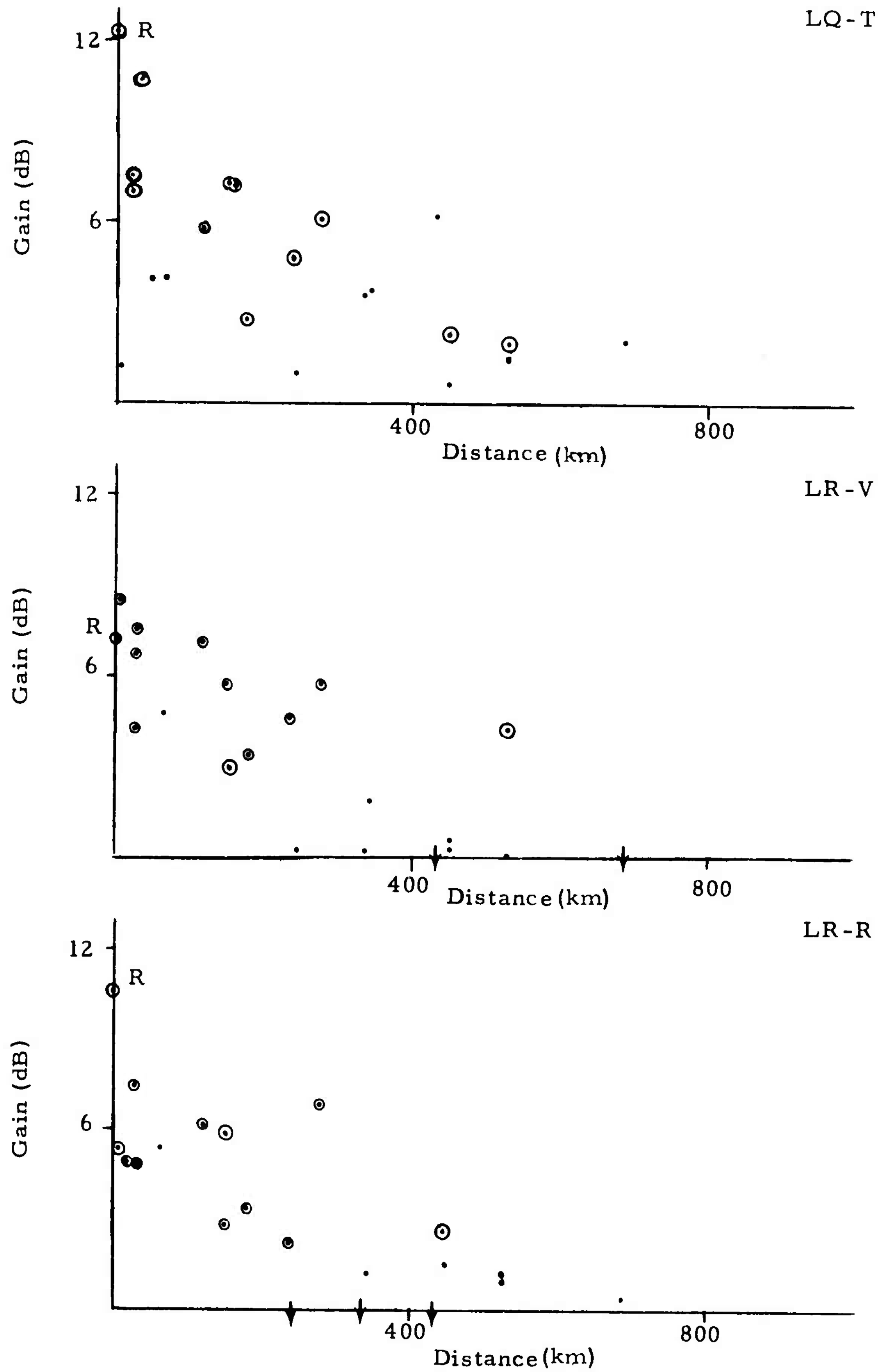

FIGURE IV-12

OPTIMUM GAIN VERSUS DISTANCE, REF. 170

The figures do not indicate any clear relation between the processing gain and the test event magnitude and/or signal-to-noise ratio, although there is a tendency in a few cases for better gains at the higher m_b's and/or SNR's. The only clear relation is the trend of decreasing gain with increasing distance, as expected, for refs. 168, 170 (Figures IV-11, IV-12), and to a lesser extent for ref. 002 (Figure IV-10).

F. VERTICAL AND RADIAL COMPONENT GAIN DIFFERENCES

For a given test event one expects a certain type reference waveform to act in a similar manner for the two Rayleigh wave components. Where this is not the case the LR-V and LR-R components apparently, in addition to differing 90° in phase, have different signal and/or noise contents. From Table IV-1 and Figures IV-1, IV-2, IV-3 we see that these differences occur rather frequently. For example, consider ref. 168 processing of event 170/17 (ref. 170), where the radial component shows a 3.9 dB better correlation than the vertical component. Table A-3 (Appendix A) shows the bandpass vertical and radial signals to have a peak amplitude of 464mμ and 450 mμ, and RMS noise levels of 3.5 mμ and 4.6mμ respectively. Ref. 168, waveform A matched filter processing, improves the signal amplitudes to 786 and 828 mμ, the matched filter output RMS noise levels are 3.0 and 2.7 mμ, respectively. Thus, where the vertical and radial signal levels are improved with factors of 1.67 and 1.84, or 4.4 dB and 5.2 dB, respectively, a difference of 0.7 dB, the respective noise levels are reduced with factors 0.86 and 0.59, or 1.5 dB and 4.7 dB, a difference of 3.2 dB, leading to signal-to-noise ratio improvements of 6.0 dB for the vertical, and 9.9 dB for the radial component. Thus, the gain differences between the two Rayleigh wave components are established for only a relatively small part, 0.7 dB, by differences in signal behavior, and for the largest part, 3.2 dB, by the differences in noise behavior. This is plausible since in many cases the vertical and radial noise components will be at least partially uncorrelated.

Similarly, for the events 170/21 (refs. 168, 170 processing), 181*13 (ref. 168 processing) and 047-23 (ref. 168 processing), the more than 2 dB differences between vertical and radial component processing gain are mainly due to noise differences. However, the events 184*04 (ref. 168 processing), 064-04 (ref. 170 processing) and 154-06 (ref. 170 processing) show that these differences are mainly caused by signal differences, possibly due to imperfect signal rotation, or multipath arrivals with different azimuths.

SECTION V

CONCLUSIONS

In the search for an optimum type reference waveform in matched filter processing of events of one region, three major events were chosen from the Sinkiang Province region as reference events. From each reference event signal trace, eight different reference waveform lengths were chosen. Each of these twenty-four waveforms was applied as a matched filter in processing twenty-one test events from the same area. The matched filter processing gains over bandpass filtering were analyzed. The analysis leads to the following conclusions:

- For the optimum reference event the distance to the events to be processed is the most important factor in most cases. However, optimization of all events, even within a relatively small region, requires more than one reference event. The location and characteristics of the additional reference events are difficult to predetermine. Optimization improves with the number of reference events available.

- The reference waveform length that is optimum for the majority of events contains the entire signal bandwidth but excludes multiple arrivals. However, optimization of all events, even a small number within a relatively small area, requires additional lengths. The characteristics of these additional waveforms are difficult to anticipate. Optimization improves with the number of reference waveforms available.

- By applying all of the available 24 different reference waveform lengths (3 events, 8 lengths per event), 2 to 10 dB gains relative to bandpass filtering were achieved for 16 out of the 21 test events located over an area of about 900 x 450 km. Four of the five low-gain events were located at least 420 km from the nearest reference event.
- Optimum Sinkiang Province processing yielded up to 8 dB improvement over to date routine processing of Central Asia events, at the expense of laborious processing.
- No relationship could be established between the matched filter processing gain and either the event magnitude or its signal-to-noise ratio. For two of the three reference events an obvious trend of decreasing gain with increasing distance was observed; for the third reference event a weaker trend was evident.
- Vertical component reference waveform matched filter processing occasionally gave more than 2 dB different gains than radial component processing due to signal or noise differences between the two components.

Summarizing, although significant processing gains are obtained by a limited number of predeterminable reference event waveforms, full optimization of reference waveform matched filtering for all events can only be obtained when a large number of different reference waveform lengths is generated from a number of reference events located throughout the area. Such optimization yields significant processing gains over routine matched filter and bandpass filter processing, but requires either laborious, or highly automated processing. The effects of such processing on false alarm rates and surface wave magnitude measurements were not investigated in this study,

however related experience leads us to believe that these parameters would behave about the same as observed for "standard" matched filter processing.

SECTION VI

REFERENCES

Capon, J., R. J. Greenfield, R. T. Lacoss, 1967, Long Period Signal Processing Results for Large Aperture Seismic Array, Lincoln Laboratory Technical Note, 1967-50, Contract AF19(628) - 5167.

Texas Instruments, 1971, Long Period Array Processing Development; Final Report, Contract F33657-69-C-1063.

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Texas Instruments, 1973, Final Evaluation of the Detection and Discrimination Capability of the Alaskan Long Period Array; Special Report No. 8, Extended Array Evaluation Program, Contract F33657-72-C-0725.

Texas Instruments, 1973, Continuous Evaluation of the Norwegian Long Period Array; Special Report No. 7, Extended Array Evaluation Program, Contract F33657-72-C-0725.

APPENDIX A

TABULATION OF RESULTS

To enable a detailed analysis of the results, the various steps of the signal-to-noise ratio improvement computation are combined in the Tables A-1 through A-21, one table per event.

Following the name of the test event, the first line in each table heading shows the name of the reference events, the second line shows the differences in great circle distance (D^o) and azimuth (A^o) from array to epicenter, and the great circle distance (S km), between the test event and each reference event. The third line indicates the waveform component concerned, LQ-T, LR-V, or LR-R. The left hand column in each table indicates the type of filter applied: BP for bandpass, A for type A reference waveform matched filter, and so on. The second column indicates the type of value presented:

SIG = maximum value of signal plus noise during the expected signal arrival in $m\mu$.

NOI = RMS noise value computed over a time gate just prior to the signal arrival, in $m\mu$.

S/N = SIG/NOI, the signal-to-noise ratio as defined in Section III. D. 3.

GN = $\frac{\text{MF S/N}}{\text{BP S/N}}$, the matched filter processing gain over bandpass filtering as defined in Section III. D. 4.

GDB = $20 \log_{10} GN$, the processing gain expressed in decibels.

The bandpass filter results SIG, NOI and S/N are repeated for each reference event.

TABLE A- 1

PROCESSING RESULTS, EVENT SIN/167/13AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 1.8 A= 3.8 S= 436			D= 0.0 A= 0.1 S= 8			D= 0.2 A=-0.1 S= 22 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	49.4	38.9	31.9	49.4	38.9	31.9	49.4	38.9	31.9
	NOI	4.5	3.4	3.5	4.5	3.4	3.5	4.5	3.4	3.5
	S/N	11.1	11.6	9.0	11.1	11.6	9.0	11.1	11.6	9.0
A	SIG	58.7	46.9	51.2	50.6	52.6	43.9	54.3	28.1	29.0
	NOI	3.6	3.2	4.1	3.3	3.4	3.8	3.2	1.7	2.6
	S/N	16.2	14.7	12.6	15.4	15.6	11.4	16.8	16.5	11.3
	GN	1.5	1.3	1.4	1.4	1.3	1.3	1.5	1.4	1.3
	GDB	3.3	2.1	2.9	2.9	2.6	2.0	3.6	3.1	2.0
B	SIG	48.2	47.3	42.7	110.0	66.9	42.8	112.3	52.3	48.4
	NOI	3.8	3.4	3.4	5.1	3.3	3.6	5.3	3.7	4.0
	S/N	12.6	13.8	12.5	21.6	20.5	11.7	21.2	14.0	12.0
	GN	1.4	1.2	1.1	1.9	1.8	1.3	1.9	1.2	1.3
	GDB	2.9	1.9	0.6	5.8	4.9	2.3	5.6	1.6	2.4
C	SIG	56.8	34.6	39.3	108.2	68.0	48.9	109.2	50.6	40.6
	NOI	5.4	4.7	3.8	4.5	3.3	4.0	4.5	3.5	3.0
	S/N	10.5	7.3	10.2	23.9	20.8	12.3	24.1	14.4	13.3
	GN	0.9	0.6	1.1	2.2	1.8	1.4	2.2	1.2	1.5
	GDB	-0.5	-4.0	1.1	6.7	5.1	2.7	6.8	1.9	3.4
D	SIG	56.2	39.0	41.7	112.8	65.6	48.1	117.7	66.3	42.7
	NOI	5.6	4.6	4.3	4.4	3.3	3.6	4.5	3.6	3.0
	S/N	10.0	8.5	9.8	25.8	19.8	13.2	26.2	18.5	14.1
	GN	0.9	0.7	1.1	2.3	1.7	1.5	2.4	1.6	1.6
	GDB	-0.9	-2.7	0.7	7.4	4.6	3.3	7.5	4.1	3.9
E	SIG	55.1	40.4	37.4	108.9	68.3	48.6	119.1	68.9	49.4
	NOI	5.0	4.6	3.6	4.6	3.2	3.7	4.3	3.6	3.1
	S/N	11.0	8.9	10.5	23.9	21.4	13.1	27.6	19.0	15.9
	GN	1.0	0.8	1.2	2.2	1.8	1.5	2.5	1.6	1.6
	GDB	-0.1	-2.4	1.3	6.7	5.3	3.2	7.9	4.2	4.9
X	SIG	62.1	46.5	25.8	77.8	59.4	54.2	76.3	54.1	43.2
	NOI	6.3	4.9	4.4	5.0	4.3	4.8	4.8	3.7	3.8
	S/N	9.9	9.4	5.9	15.6	13.7	11.2	15.9	14.5	11.5
	GN	0.9	0.8	0.7	1.4	1.2	1.2	1.4	1.3	1.3
	GDB	-1.0	-1.8	-3.7	3.0	1.5	1.9	3.2	1.9	2.1
Y	SIG	61.1	37.8	33.0	70.7	57.2	51.4	70.4	44.3	35.9
	NOI	6.4	4.8	4.1	4.0	4.1	4.8	3.8	3.4	2.9
	S/N	9.6	7.9	8.0	17.5	14.1	10.7	18.3	12.9	12.4
	GN	0.9	0.7	0.9	1.6	1.2	1.2	1.7	1.1	1.4
	GDB	-1.2	-3.3	-1.0	4.0	1.6	1.5	4.4	0.9	2.7
Z	SIG	53.5	37.0	30.9	85.0	52.5	49.1	71.8	57.2	40.9
	NOI	5.0	4.2	3.7	4.5	3.7	3.7	3.5	3.4	3.1
	S/N	10.6	8.7	8.4	19.0	14.3	13.4	20.5	16.9	12.7
	GN	1.0	0.8	0.9	1.7	1.2	1.5	1.9	1.4	1.4
	GDB	-0.4	-2.5	-0.6	4.7	1.8	3.4	5.4	3.2	3.0

* D=DELTA DIFF(DEG)   A=AZIMUTH DIFF(DEG)   S=DISTANCE TO REF(KM)

TABLE A- 2

PROCESSING RESULTS, EVENT SIN/168/15AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 1.8 A= 3.7 S= 428			D= 0.0 A= 0.0 S= 0			D= 0.2 A=-0.1 S= 24 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	23.0	21.2	17.9	23.0	21.2	17.9	23.0	21.2	17.9
	NOI	2.8	2.5	2.5	2.8	2.5	2.5	2.8	2.5	2.5
	S/N	8.1	8.3	7.1	8.1	8.3	7.1	8.1	8.3	7.1
A	SIG	31.5	27.2	26.1	30.9	29.5	27.4	29.9	9.6	11.5
	NOI	2.5	2.8	1.9	2.3	2.0	2.1	2.2	2.5	1.5
	S/N	12.5	9.6	13.6	13.3	14.6	13.1	13.4	3.8	7.5
	GN	1.5	1.1	1.9	1.6	1.9	1.9	1.7	0.5	1.1
	GDB	3.7	1.2	5.7	4.3	4.9	5.4	4.4	-6.8	0.5
B	SIG	29.1	24.2	19.4	64.7	38.7	32.9	59.5	27.6	24.5
	NOI	2.3	2.1	2.1	3.2	1.8	1.8	2.5	2.7	1.7
	S/N	12.9	11.4	9.1	20.4	21.0	18.6	23.4	10.2	14.5
	GN	1.6	1.4	1.3	2.5	2.5	2.6	2.9	1.2	2.0
	GDB	4.0	2.7	2.2	8.0	8.0	8.4	9.2	1.8	6.2
C	SIG	33.6	20.2	17.9	69.2	39.4	39.9	60.7	28.3	23.0
	NOI	2.4	2.8	2.9	2.9	2.0	2.6	2.2	2.0	1.5
	S/N	14.3	7.3	6.2	23.5	19.5	15.6	27.6	14.2	14.9
	GN	1.8	0.9	0.9	2.9	2.3	2.2	3.4	1.7	2.1
	GDB	4.9	-1.1	-1.1	9.2	7.4	6.9	10.6	4.6	6.5
D	SIG	34.5	21.9	15.9	74.9	41.1	44.6	67.3	37.5	26.0
	NOI	2.4	3.2	3.4	3.4	2.0	3.0	2.6	2.0	1.5
	S/N	14.1	6.9	4.6	22.3	20.8	15.0	26.0	18.4	17.5
	GN	1.7	0.8	0.7	2.7	2.5	2.1	3.2	2.2	2.5
	GDB	4.8	-1.6	-3.7	8.8	8.0	6.6	10.1	6.9	7.9
E	SIG	22.6	13.8	32.9	75.9	43.4	46.7	67.6	37.2	26.7
	NOI	3.2	3.1	2.5	3.5	2.1	3.1	2.7	2.2	1.7
	S/N	7.0	4.4	13.0	21.9	20.4	14.8	25.1	16.7	15.7
	GN	0.8	0.6	1.6	2.7	2.4	2.1	3.1	2.0	2.2
	GDB	-1.5	-4.1	4.1	8.6	7.9	6.4	9.8	6.0	7.0
X	SIG	42.1	28.6	20.5	43.7	35.1	30.0	38.6	29.5	23.4
	NOI	2.8	3.4	3.5	2.6	2.3	2.1	1.9	2.2	1.6
	S/N	15.3	8.4	5.9	17.0	15.2	14.1	20.5	13.4	14.3
	GN	1.9	1.0	0.8	2.1	1.8	2.0	2.5	1.6	2.0
	GDB	5.5	0.0	-1.6	6.4	5.2	6.0	8.0	4.1	6.1
Y	SIG	35.1	22.0	18.0	46.4	33.9	34.9	39.1	25.2	20.9
	NOI	2.7	3.2	3.1	2.1	2.4	3.4	1.6	1.6	1.5
	S/N	13.0	6.9	5.8	22.4	13.9	10.2	25.0	15.3	14.3
	GN	1.6	0.8	0.8	2.8	1.7	1.4	3.1	1.8	2.0
	GDB	4.1	-1.6	-1.7	8.8	4.5	3.2	9.7	5.2	6.1
Z	SIG	31.5	20.7	13.6	58.7	36.2	34.9	41.7	33.0	25.1
	NOI	2.5	2.9	3.2	2.9	2.4	3.4	1.9	1.7	1.5
	S/N	12.5	7.1	4.2	20.3	15.1	10.1	22.5	19.7	17.0
	GN	1.5	0.9	0.6	2.5	1.8	1.4	2.8	2.4	2.4
	GDB	3.7	-1.4	-4.5	8.0	5.2	3.1	8.8	7.5	7.6

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A- 3

PROCESSING RESULTS, EVENT SIN/170/17AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 1.6 A= 3.9 S= 433			D=-0.2 A= 0.1 S= 24			D= 0.0 A= 0.0 S= 0 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	975.1	463.8	449.5	975.1	463.8	449.5	975.1	463.8	449.5
	NOI	8.9	3.5	4.6	8.9	3.5	4.6	8.9	3.5	4.6
	S/N	109.6	133.6	97.1	109.6	133.6	97.1	109.6	133.6	97.1
A	SIG	1235.6	712.0	767.0	1099.0	786.4	828.6	1173.0	290.1	406.4
	NOI	12.5	3.9	4.4	11.5	3.0	2.7	11.2	5.8	7.6
	S/N	98.7	183.3	174.9	95.9	265.2	304.1	105.0	49.8	53.4
	GN	0.9	1.4	1.8	0.9	2.0	3.1	1.0	0.4	0.5
	GDB	-0.9	2.7	5.1	-1.2	6.0	9.9	-0.4	-8.6	-5.2
B	SIG	1018.1	544.4	512.3	2365.5	827.2	734.6	2401.6	923.9	990.8
	NOI	10.2	3.7	5.5	12.8	4.0	3.7	11.1	4.8	4.2
	S/N	99.8	146.5	93.4	185.0	207.3	199.7	216.0	192.3	212.6
	GN	0.9	1.1	1.0	1.7	1.6	2.1	2.0	1.4	2.2
	GDB	-0.8	0.8	-0.3	4.5	3.8	6.3	5.9	3.2	6.8
C	SIG	1343.3	532.8	431.1	2410.7	854.3	861.4	2379.7	989.5	863.9
	NOI	6.1	3.0	4.3	10.2	6.5	6.8	9.9	4.1	3.7
	S/N	221.3	179.7	99.4	237.4	130.8	127.5	241.4	244.0	235.0
	GN	2.0	1.3	1.0	2.2	1.0	1.3	2.2	1.8	2.4
	GDB	6.1	2.6	0.2	6.7	-0.2	2.4	6.9	5.2	7.7
D	SIG	1349.4	528.3	438.2	2389.6	838.4	878.3	2576.2	1128.7	887.4
	NOI	5.0	3.4	5.5	10.9	7.4	8.6	11.2	3.7	3.6
	S/N	268.3	156.7	79.9	220.0	113.7	102.1	229.9	309.0	243.6
	GN	2.4	1.2	0.8	2.0	0.9	1.1	2.1	2.3	2.5
	GDB	7.8	1.4	-1.7	6.0	-1.4	0.4	6.4	7.3	3.0
E	SIG	1304.6	531.3	403.0	2266.2	865.9	898.3	2559.6	1293.6	1009.0
	NOI	5.6	4.4	5.5	14.3	7.9	10.2	13.4	8.7	8.1
	S/N	231.5	120.2	73.3	158.8	109.7	88.4	190.7	148.9	124.6
	GN	2.1	0.9	0.8	1.4	0.8	0.9	1.7	1.1	1.3
	GDB	6.5	-0.9	-2.4	3.2	-1.7	-0.8	4.8	0.9	2.2
X	SIG	1495.5	540.8	378.6	1646.2	798.8	908.0	1602.4	863.8	803.6
	NOI	4.9	2.9	3.7	5.6	3.0	4.8	3.5	3.3	2.5
	S/N	306.1	187.6	101.2	294.8	264.6	188.5	452.0	264.6	324.7
	GN	2.8	1.4	1.0	2.7	2.0	1.9	4.1	2.0	3.3
	GDB	8.9	2.9	0.4	8.6	5.9	5.9	12.3	5.9	10.5
Y	SIG	1445.5	574.3	446.2	1596.5	690.4	851.9	1531.8	859.6	774.3
	NOI	4.8	3.2	3.8	4.9	3.6	6.2	4.0	2.9	2.5
	S/N	301.1	179.6	118.6	326.9	190.3	136.9	382.1	291.7	304.9
	GN	2.7	1.3	1.2	3.0	1.4	1.4	3.5	2.2	3.1
	GDB	8.8	2.6	1.7	9.5	3.1	3.0	10.8	6.8	9.9
Z	SIG	1284.2	543.1	403.4	1767.1	696.9	776.9	1572.5	966.8	936.3
	NOI	4.8	5.0	4.2	9.5	10.7	8.5	7.0	4.1	4.3
	S/N	269.2	109.3	96.2	186.1	65.3	91.9	224.1	237.4	193.8
	GN	2.5	0.8	1.0	1.7	0.5	0.9	2.0	1.8	2.0
	GDB	7.8	-1.7	-0.1	4.6	-6.2	-0.5	6.2	5.0	6.0

* D=DELTA DIFF(DEG)   A=AZIMUTH DIFF(DEG)   S=DISTANCE TO REF(KM)

TABLE A- 4

PROCESSING RESULTS, EVENT SIN/170/21AL

FI LT ER	REF DIF COM	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
		D= 1.2 A= 3.8 S= 425			D=-0.2 A= 0.1 S= 22			D= 0.0 A=-0.1 S= 8 *		
		LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
	SIG	32.1	34.0	20.3	32.1	34.0	20.3	32.1	34.0	20.3
BP	NOI	3.0	4.2	2.2	3.0	4.2	2.2	3.0	4.2	2.2
	S/N	10.6	8.2	9.4	10.6	8.2	9.4	10.6	8.2	9.4
	SIG	28.1	51.9	37.4	21.7	46.3	28.6	25.4	27.8	20.3
	NOI	3.5	5.9	3.0	3.1	3.3	2.2	3.3	5.3	2.1
A	S/N	8.0	8.8	12.3	7.0	14.1	13.0	7.8	5.3	9.8
	GN	0.8	1.1	1.3	0.7	1.7	1.4	0.7	0.6	1.0
	GDB	-2.5	0.7	2.3	-3.7	4.7	2.8	-2.7	-3.8	0.4
	SIG	22.3	34.2	35.4	47.5	50.2	31.1	44.3	57.7	37.5
	NOI	3.1	3.4	2.4	4.8	2.4	2.0	4.6	5.3	2.2
B	S/N	7.3	10.0	14.7	9.9	20.9	15.5	9.6	10.8	16.7
	GN	0.7	1.2	1.6	0.9	2.6	1.7	0.9	1.3	1.8
	GDB	-3.3	1.8	3.9	-0.6	8.1	4.4	-0.8	2.4	5.0
	SIG	22.2	30.1	17.3	45.6	51.0	36.8	43.2	59.8	27.9
	NOI	3.0	2.5	2.1	4.2	2.5	2.3	4.1	3.4	1.7
C	S/N	7.3	12.1	8.1	10.9	20.4	15.8	10.6	17.6	16.4
	GN	0.7	1.5	0.9	1.0	2.5	1.7	1.0	2.1	1.7
	GDB	-3.2	3.4	-1.3	0.2	7.9	4.5	0.0	6.6	4.8
	SIG	21.8	33.8	19.4	47.0	51.5	37.9	45.4	45.9	23.4
	NOI	3.1	2.7	2.1	4.3	2.5	2.4	4.3	3.0	1.6
D	S/N	7.1	12.7	9.1	11.0	20.2	15.8	10.5	15.1	14.3
	GN	0.7	1.6	1.0	1.0	2.5	1.7	1.0	1.8	1.5
	GDB	-3.5	3.8	-0.3	0.3	7.9	4.5	-0.1	5.3	3.7
	SIG	21.1	34.8	17.8	44.4	54.3	39.6	44.3	44.2	25.0
	NOI	3.1	3.1	2.0	4.1	2.7	2.4	4.3	3.0	1.7
E	S/N	6.8	11.1	8.9	10.9	20.0	16.3	10.4	14.9	14.9
	GN	0.6	1.4	0.9	1.0	2.4	1.7	1.0	1.8	1.6
	GDB	-3.9	2.7	-0.5	0.2	7.8	4.8	-0.2	5.2	4.0
	SIG	33.0	21.8	27.2	38.8	52.4	40.9	31.6	52.4	32.8
	NOI	2.6	2.1	3.0	3.6	2.7	2.4	3.3	3.6	1.9
X	S/N	12.6	10.1	9.0	10.7	19.3	16.8	9.6	14.6	17.4
	GN	1.5	1.1	0.9	1.0	2.4	1.8	0.9	1.8	1.9
	GDB	3.8	0.7	-1.4	0.1	7.4	5.1	-0.8	5.0	5.4
	SIG	25.2	30.2	18.3	32.8	49.9	43.0	28.9	49.1	23.3
	NOI	3.0	2.3	2.2	2.6	2.7	2.6	2.4	2.2	1.4
Y	S/N	8.5	13.3	8.2	12.7	18.6	16.5	12.1	21.8	16.8
	GN	0.8	1.6	0.9	1.2	2.3	1.8	1.1	2.7	1.8
	GDB	-2.0	4.2	-1.1	1.6	7.1	4.9	1.2	8.5	5.0
	SIG	23.1	29.6	17.6	38.3	49.7	36.2	28.3	39.0	20.8
	NOI	2.7	2.5	1.9	3.0	2.9	2.4	2.4	2.0	1.5
Z	S/N	8.5	11.8	9.2	12.6	17.3	14.9	11.8	19.8	13.5
	GN	0.8	1.4	1.0	1.2	2.1	1.6	1.1	2.4	1.4
	GDB	-1.9	3.2	-0.2	1.5	6.5	4.0	0.9	7.7	3.2

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A- 5

PROCESSING RESULTS, EVENT SIN*184*04AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 1.8 A= 3.8 S= 436			D= 0.0 A= 0.1 S= 8			D= 0.2 A=-0.1 S= 22 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	72.5	52.1	49.8	72.5	52.1	49.8	72.5	52.1	49.8
	NOI	5.7	4.7	5.0	5.7	4.7	5.0	5.7	4.7	5.0
	S/N	12.8	11.1	9.9	12.8	11.1	9.9	12.8	11.1	9.9
A	SIG	59.6	81.2	65.9	44.7	74.9	65.9	49.1	36.1	42.6
	NOI	6.0	5.0	7.1	4.8	3.3	4.2	5.5	4.4	5.4
	S/N	9.8	16.2	9.3	9.3	22.8	15.7	8.9	8.3	7.9
	GN	0.8	1.5	0.9	0.7	2.1	1.6	0.7	0.7	0.8
	GDB	-2.3	3.2	-0.5	-2.8	6.2	4.0	-3.1	-2.5	-1.9
B	SIG	73.7	67.7	58.5	132.6	90.3	67.1	135.3	83.3	57.2
	NOI	6.5	4.1	4.8	7.4	3.2	4.1	6.7	4.8	4.9
	S/N	11.4	16.4	12.3	18.0	28.4	16.4	20.1	17.4	11.7
	GN	0.9	1.5	1.2	1.4	2.6	1.7	1.6	1.6	1.2
	GDB	-1.0	3.4	1.9	3.0	8.1	4.4	3.9	3.9	1.5
C	SIG	69.9	68.5	52.3	120.6	83.1	72.9	121.0	88.1	46.5
	NOI	6.5	5.0	4.0	7.0	3.3	4.2	6.4	3.6	3.3
	S/N	10.8	13.6	12.9	17.1	24.9	17.2	19.0	24.1	14.1
	GN	0.8	1.2	1.3	1.3	2.2	1.7	1.5	2.2	1.4
	GDB	-1.5	1.7	2.3	2.5	7.0	4.8	3.5	6.7	3.1
D	SIG	70.9	76.8	56.4	121.5	83.2	70.7	128.0	83.8	48.5
	NOI	6.1	5.7	4.7	6.4	3.7	4.5	5.6	3.7	3.1
	S/N	11.7	13.5	11.9	18.9	22.7	15.6	22.9	22.6	15.9
	GN	0.9	1.2	1.2	1.5	2.0	1.6	1.8	2.0	1.6
	GDB	-0.8	1.7	1.6	3.4	6.2	4.0	5.1	6.1	4.1
E	SIG	71.2	77.8	52.4	118.8	86.0	73.2	127.0	82.9	45.8
	NOI	5.2	5.9	4.5	5.5	3.7	4.7	4.1	3.7	2.8
	S/N	13.7	13.1	11.8	21.6	22.9	15.7	30.6	22.5	16.1
	GN	1.1	1.2	1.2	1.7	2.1	1.6	2.4	2.0	1.6
	GDB	0.6	1.5	1.5	4.5	6.3	4.0	7.6	6.1	4.3
X	SIG	74.7	76.0	40.0	119.1	81.6	62.8	111.5	86.5	40.3
	NOI	5.9	6.0	4.8	6.3	4.7	5.4	5.3	3.8	3.7
	S/N	12.7	12.7	8.4	19.0	17.2	11.5	21.2	22.6	13.4
	GN	1.0	1.1	0.8	1.5	1.5	1.2	1.7	2.0	1.4
	GDB	-0.1	1.2	-1.4	3.4	3.8	1.4	4.4	6.2	2.7
Y	SIG	78.8	71.5	41.9	91.9	69.1	60.5	87.6	76.1	43.4
	NOI	6.3	5.4	4.2	5.0	4.4	5.9	5.0	3.2	2.8
	S/N	12.4	13.2	9.9	18.2	15.6	10.3	17.3	23.8	15.6
	GN	1.0	1.2	1.0	1.4	1.4	1.0	1.4	2.1	1.6
	GDB	-0.3	1.5	0.0	3.1	2.9	0.4	2.6	6.6	4.0
Z	SIG	70.6	69.8	39.7	102.9	63.2	48.8	86.5	70.7	50.6
	NOI	5.2	5.5	4.3	5.8	4.7	4.3	4.1	3.1	2.9
	S/N	13.5	12.8	9.2	17.7	13.6	11.3	21.0	22.9	17.4
	GN	1.1	1.1	0.9	1.4	1.2	1.1	1.6	2.1	1.8
	GDB	0.5	1.2	-0.6	2.8	1.7	1.2	4.3	6.3	4.9

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A- 6

PROCESSING RESULTS, EVENT SIN*281*09AL

FI LT FR	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 2.2	A= 3.9	S= 467	D= 0.4	A= 0.2	S= 47	D= 0.6	A= 0.1	S= 61 *
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	10.8	14.3	14.7	10.8	14.3	14.7	10.8	14.3	14.7
	NOI	3.9	2.9	3.2	3.9	2.9	3.2	3.9	2.9	3.2
	S/N	2.8	5.0	4.6	2.8	5.0	4.6	2.8	5.0	4.6
A	SIG	18.7	23.0	12.1	10.0	21.5	21.2	10.3	7.7	16.7
	NOI	4.2	5.6	6.0	5.5	3.0	2.9	5.7	3.6	4.0
	S/N	4.5	4.1	2.0	1.8	7.1	7.2	1.8	2.1	4.1
	GN	0.9	0.9	0.7	0.6	1.4	1.6	0.6	0.4	0.9
	GDB	-0.8	-1.0	-2.8	-3.8	3.1	3.9	-3.8	-7.4	-1.0
B	SIG	12.7	14.2	17.8	15.7	19.4	15.3	16.4	22.7	23.1
	NOI	5.3	2.7	4.3	6.5	2.8	2.8	6.4	3.8	3.4
	S/N	2.4	5.3	4.2	2.4	6.9	5.4	2.6	5.9	6.8
	GN	0.9	1.1	0.9	0.9	1.4	1.2	0.9	1.2	1.5
	GDB	-1.4	0.6	-0.9	-1.3	2.9	1.4	-0.7	1.6	3.3
C	SIG	12.8	21.0	22.1	15.8	18.0	19.3	16.2	24.7	21.3
	NOI	3.6	1.9	2.1	5.3	2.7	3.1	5.2	2.9	2.7
	S/N	3.5	10.9	10.6	3.0	6.6	6.2	3.1	8.6	7.9
	GN	1.3	2.2	2.3	1.1	1.3	1.3	1.1	1.7	1.7
	GDB	2.0	6.8	7.2	0.6	2.5	2.5	0.9	4.8	4.7
D	SIG	12.9	22.3	24.3	16.0	18.5	18.3	17.0	22.2	19.9
	NOI	3.5	2.0	2.3	5.1	3.0	3.1	5.5	2.8	2.4
	S/N	3.7	11.1	10.6	3.1	6.2	5.9	3.1	7.8	8.3
	GN	1.3	2.2	2.3	1.1	1.3	1.3	1.1	1.6	1.8
	GDB	2.4	7.0	7.2	0.9	2.0	2.2	0.9	4.0	5.1
E	SIG	12.6	22.1	22.9	14.3	18.8	19.4	16.6	21.7	21.3
	NOI	3.3	2.2	2.0	4.7	3.1	3.1	5.2	3.1	2.4
	S/N	3.8	10.2	11.6	3.1	6.0	6.2	3.2	7.1	8.7
	GN	1.4	2.1	2.5	1.1	1.2	1.3	1.1	1.4	1.9
	GDB	2.6	6.3	8.0	0.8	1.7	2.5	1.1	3.1	5.5
X	SIG	14.0	21.7	20.2	14.6	22.8	22.9	12.4	24.6	19.7
	NOI	2.8	1.9	1.9	4.1	2.5	3.9	3.6	3.1	2.7
	S/N	5.0	11.3	10.6	3.6	9.3	5.9	3.4	7.9	7.3
	GN	1.8	2.3	2.3	1.3	1.9	1.3	1.2	1.6	1.6
	GDB	5.0	7.2	7.2	2.1	5.4	2.2	1.8	4.1	3.9
Y	SIG	15.0	22.7	20.9	11.6	18.9	21.5	10.9	21.9	17.6
	NOI	3.1	1.8	1.8	3.0	2.5	3.9	2.4	2.7	2.2
	S/N	4.8	12.4	11.4	3.9	7.5	5.4	4.5	9.1	8.1
	GN	1.7	2.5	2.5	1.4	1.5	1.2	1.6	1.6	1.8
	GDB	4.7	7.9	7.8	2.8	3.6	1.4	4.1	4.3	4.9
Z	SIG	13.0	21.1	21.0	12.8	19.4	18.7	10.4	21.7	18.4
	NOI	2.8	1.8	1.8	3.6	2.6	2.9	2.4	2.7	2.1
	S/N	4.7	11.5	12.0	3.6	7.5	6.4	4.3	7.9	8.6
	GN	1.7	2.7	2.6	1.3	1.5	1.4	1.5	1.6	1.9
	GDB	4.5	7.4	8.3	2.1	3.6	2.9	3.7	4.1	5.4

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A- 7

PROCESSING RESULTS, EVENT SIN*221*01AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 0.0 A= 1.0 S= 97			D=-1.8 A=-2.8 S= 344			D=-1.6 A=-2.9 S= 246 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	12.2	22.3	15.8	12.2	22.3	15.9	12.2	22.3	15.8
	NOI	2.0	2.1	2.4	2.0	2.1	2.4	2.0	2.1	2.4
	S/N	6.1	10.4	6.5	6.1	10.4	6.5	6.1	10.4	6.5
A	SIG	12.3	24.2	14.9	9.3	16.8	15.4	10.0	9.2	7.8
	NOI	2.3	2.0	3.4	2.2	2.0	2.5	2.2	1.3	2.7
	S/N	5.3	12.0	4.4	4.3	8.4	6.3	4.6	6.2	2.9
	GN	0.9	1.1	0.7	0.7	0.8	1.0	0.8	0.6	0.4
	GDB	-1.2	1.2	-3.5	-3.0	-1.9	-0.3	-2.5	-4.6	-7.1
B	SIG	16.5	21.2	16.0	15.6	21.9	12.4	15.6	21.2	16.2
	NOI	2.0	2.0	2.9	2.7	1.8	2.2	2.4	2.4	2.6
	S/N	8.3	10.4	5.5	5.9	12.0	5.7	6.5	8.9	6.3
	GN	1.4	1.0	0.9	1.0	1.2	0.9	1.1	0.9	1.0
	GDB	2.7	0.0	-1.4	-0.3	1.2	-1.1	0.5	-1.3	-0.3
C	SIG	23.7	36.2	21.4	13.2	24.7	17.5	14.1	22.8	11.1
	NOI	1.9	2.4	2.4	2.5	1.9	2.6	2.2	1.9	2.0
	S/N	12.5	15.2	9.0	5.3	13.1	6.6	6.5	12.3	5.4
	GN	2.1	1.5	1.4	0.9	1.3	1.0	1.1	1.2	0.8
	GDB	6.3	3.3	2.9	-1.2	2.0	0.1	0.6	1.4	-1.6
D	SIG	24.0	34.3	21.7	13.7	22.9	14.8	14.1	21.6	10.3
	NOI	1.9	2.7	2.3	2.6	1.9	2.8	2.2	1.8	1.8
	S/N	12.3	12.9	9.4	5.3	12.1	5.2	6.3	11.9	5.6
	GN	2.0	1.2	1.4	0.9	1.2	0.8	1.0	1.1	0.9
	GDB	6.1	1.9	3.2	-1.3	1.3	-1.9	0.2	1.1	-1.3
E	SIG	22.9	34.4	20.1	12.9	22.9	15.2	13.7	20.1	10.1
	NOI	1.9	2.9	2.1	2.5	2.0	3.0	2.2	2.1	2.0
	S/N	12.2	12.0	9.7	5.1	11.4	5.0	6.3	9.6	5.0
	GN	2.0	1.2	1.5	0.8	1.1	0.8	1.0	0.9	0.9
	GDB	6.1	1.3	3.4	-1.5	0.8	-2.3	0.3	-0.7	-2.3
X	SIG	17.6	43.6	24.4	15.4	35.2	22.3	14.1	22.4	14.7
	NOI	1.9	3.0	2.3	1.9	2.2	3.0	1.5	2.2	2.3
	S/N	9.3	14.6	10.5	7.9	16.0	7.4	9.3	10.2	6.4
	GN	1.5	1.4	1.6	1.3	1.5	1.1	1.5	1.0	1.0
	GDB	3.7	3.0	4.1	2.3	3.8	1.1	3.7	-0.1	-0.1
Y	SIG	22.2	41.2	23.4	11.3	37.9	28.4	11.0	21.2	11.7
	NOI	2.0	2.8	2.3	1.6	2.2	3.2	1.4	1.7	1.8
	S/N	11.0	14.9	10.0	7.0	17.4	8.9	8.0	12.7	6.3
	GN	1.8	1.4	1.5	1.1	1.7	1.4	1.3	1.2	1.0
	GDB	5.1	3.1	3.7	1.2	4.5	2.7	2.3	1.8	-0.2
Z	SIG	19.9	34.1	20.0	13.5	33.9	19.1	10.9	19.9	12.9
	NOI	1.8	2.7	2.0	2.0	2.2	2.9	1.4	1.7	1.7
	S/N	11.1	12.6	10.1	6.6	15.7	6.6	7.9	11.7	7.5
	GN	1.8	1.2	1.5	1.1	1.5	1.0	1.3	1.1	1.3
	GDB	5.2	1.7	3.8	0.7	3.6	0.2	2.2	1.0	1.3

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A- 8

PROCESSING RESULTS, EVENT SIN-002-10AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 0.0 A= 0.0 S= 0			D=-1.8 A=-3.7 S= 428			D=-1.6 A=-3.9 S= 433 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	114.5	149.7	131.5	114.5	149.7	131.5	114.5	149.7	131.5
	NOI	5.1	4.7	4.2	5.1	4.7	4.2	5.1	4.7	4.2
	S/N	22.2	31.7	31.6	22.2	31.7	31.6	22.2	31.7	31.6
A	SIG	78.6	91.9	99.8	61.7	49.5	96.7	65.9	34.1	44.8
	NOI	6.5	5.6	5.8	5.5	5.7	4.1	5.9	3.4	3.9
	S/N	12.2	16.3	17.3	11.1	8.7	23.6	11.1	10.2	11.4
	GN	0.5	0.5	0.5	0.5	0.3	0.7	0.5	0.3	0.4
	GDB	-5.2	-5.8	-5.2	-6.0	-11.2	-2.5	-6.0	-9.9	-8.8
B	SIG	128.9	137.0	127.4	155.8	100.8	78.3	164.2	105.3	66.2
	NOI	6.3	5.0	5.0	7.4	5.1	3.7	7.0	6.0	3.9
	S/N	20.5	27.6	25.3	21.1	19.6	20.9	23.4	17.4	17.1
	GN	0.9	0.9	0.8	0.9	0.6	0.7	1.1	0.5	0.5
	GDB	-0.7	-1.2	-1.9	-0.5	-4.2	-3.6	0.4	-5.2	-5.3
C	SIG	344.5	278.3	241.3	176.3	109.0	108.9	183.3	79.1	52.7
	NOI	5.2	4.2	4.4	6.8	5.2	4.6	6.2	5.2	3.1
	S/N	65.8	66.9	55.3	25.9	21.1	23.6	29.4	15.3	16.7
	GN	3.0	2.1	1.7	1.2	0.7	0.7	1.3	0.5	0.5
	GDB	9.4	6.5	4.8	1.3	-3.5	-2.5	2.4	-6.3	-5.5
D	SIG	347.4	311.4	272.5	177.6	111.4	87.5	192.8	123.8	60.7
	NOI	5.2	5.4	4.8	7.0	6.0	5.4	6.8	5.1	2.9
	S/N	67.1	58.0	56.5	25.5	18.5	16.3	28.5	24.5	20.9
	GN	3.0	1.8	1.8	1.1	0.6	0.5	1.3	0.8	0.7
	GDB	9.6	5.3	5.0	1.2	-4.7	-5.8	2.1	-2.2	-3.6
E	SIG	336.2	320.9	253.3	160.6	113.8	83.9	188.9	108.6	65.5
	NOI	4.9	5.9	4.6	7.2	7.2	5.7	7.7	6.2	3.8
	S/N	68.0	54.2	55.5	22.2	15.9	14.7	24.5	17.4	17.1
	GN	3.1	1.7	1.8	1.0	0.5	0.5	1.1	0.5	0.5
	GDB	9.7	4.7	4.9	-0.0	-6.0	-6.7	0.8	-5.2	-5.3
X	SIG	228.9	290.5	319.1	172.0	210.9	143.7	174.2	105.8	74.1
	NOI	4.4	5.4	4.6	5.7	5.4	4.8	4.9	6.0	3.7
	S/N	51.7	54.0	69.9	30.3	39.3	29.8	35.5	17.7	20.0
	GN	1.6	1.7	3.1	1.4	1.2	0.9	1.6	0.6	0.6
	GDB	4.3	4.6	10.0	2.7	1.9	-0.5	4.1	-5.0	-4.0
Y	SIG	351.5	297.7	233.0	199.0	208.9	170.2	186.3	85.2	58.4
	NOI	5.3	5.0	4.3	4.8	5.5	5.3	4.0	5.1	2.9
	S/N	66.3	59.7	54.5	41.2	38.3	31.8	46.1	16.8	20.3
	GN	3.0	1.9	1.7	1.9	1.2	1.0	2.1	0.5	0.6
	GDB	9.5	5.5	4.7	5.4	1.7	0.1	6.3	-5.5	-3.8
Z	SIG	314.2	290.2	229.6	217.2	211.3	112.4	182.6	113.5	65.5
	NOI	4.5	5.5	4.4	6.1	8.6	5.3	5.0	4.8	3.0
	S/N	69.2	52.8	52.8	35.5	24.6	21.2	36.6	23.5	21.8
	GN	3.1	1.7	1.7	1.6	0.8	0.7	1.6	0.7	0.7
	GDB	9.9	4.4	4.4	4.1	-2.2	-3.5	4.3	-2.6	-3.2

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A- 9

PROCESSING RESULTS, EVENT SIN-037-07AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 0.8 A= 1.7 S= 192			D=-1.0 A=-2.0 S= 236			D=-0.8 A=-2.2 S= 241 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	24.8	25.9	22.9	24.8	25.9	22.9	24.8	25.9	22.9
	NOI	9.4	6.7	8.0	9.4	6.7	8.0	9.4	6.7	8.0
	S/N	2.6	3.9	2.8	2.6	3.9	2.8	2.6	3.9	2.8
A	SIG	33.5	30.7	35.7	29.5	22.0	23.5	31.6	29.4	27.0
	NOI	11.8	9.9	11.9	11.5	6.5	10.1	11.7	7.4	8.6
	S/N	2.8	3.1	3.0	2.6	3.4	2.3	2.7	4.0	3.1
	GN	1.1	0.8	1.1	1.0	0.9	0.8	1.0	1.0	1.1
	GDB	0.6	-2.0	0.5	-0.3	-1.1	-1.7	0.1	0.2	0.8
B	SIG	38.1	21.1	25.6	40.1	17.6	18.5	42.6	30.5	24.4
	NOI	10.5	6.0	9.1	16.0	4.9	8.0	16.3	8.6	10.3
	S/N	3.6	3.5	2.8	2.5	3.6	2.3	2.6	3.5	2.4
	GN	1.4	0.9	1.0	0.9	0.9	0.8	1.0	0.9	0.8
	GDB	2.8	-0.8	-0.1	-0.5	-0.7	-1.8	-0.1	-0.8	-1.6
C	SIG	22.2	19.0	17.4	38.2	17.4	23.7	36.1	25.3	19.7
	NOI	10.3	5.1	6.7	12.9	5.4	9.1	13.5	7.0	9.1
	S/N	2.2	3.7	2.6	2.9	3.2	2.6	2.7	3.6	2.2
	GN	0.8	1.0	0.9	1.1	0.8	0.9	1.0	0.9	0.8
	GDB	-1.8	-0.3	-0.9	0.9	-1.6	-0.8	0.1	-0.6	-2.4
D	SIG	22.1	16.9	19.0	41.2	16.7	21.7	38.4	23.4	12.3
	NOI	10.5	5.2	6.9	12.6	5.5	8.4	14.6	6.1	[illegible]
	S/N	2.1	3.3	2.7	3.3	3.0	2.6	2.6	3.8	2.4
	GN	0.8	0.8	1.0	1.2	0.8	0.9	1.0	1.0	0.8
	GDB	-2.0	-1.5	-0.3	1.8	-2.1	-0.8	-0.0	-0.1	-1.6
E	SIG	21.2	16.9	18.1	39.6	17.9	23.4	38.5	19.5	12.7
	NOI	9.8	5.3	6.6	11.1	5.8	8.9	12.9	6.9	8.1
	S/N	2.2	3.2	2.8	3.6	3.1	2.6	3.0	2.8	1.6
	GN	0.8	0.8	1.0	1.3	0.8	0.9	1.1	0.7	0.6
	GDB	-1.7	-1.7	-0.3	2.6	-2.0	-0.7	1.0	-2.8	-5.1
X	SIG	21.9	14.2	15.4	30.7	17.8	32.9	25.7	21.6	22.0
	NOI	9.9	6.1	6.0	12.9	6.5	10.9	12.4	6.8	9.4
	S/N	2.2	2.3	2.6	2.4	2.7	3.0	2.1	3.2	2.4
	GN	0.8	0.6	0.9	0.9	0.7	1.1	0.8	0.8	0.9
	GDB	-1.6	-4.4	-0.9	-0.9	-3.1	0.5	-2.2	-1.7	-1.6
Y	SIG	22.6	17.9	14.8	22.8	15.0	37.5	18.6	18.2	13.8
	NOI	9.8	5.3	6.7	8.1	6.8	10.7	7.8	6.1	8.5
	S/N	2.3	3.4	2.2	2.8	2.2	3.5	2.4	3.0	1.6
	GN	0.9	0.9	0.8	1.1	0.6	1.2	0.9	0.8	0.6
	GDB	-1.1	-1.2	-2.2	0.5	-4.9	1.8	-1.0	-2.3	-4.9
Z	SIG	19.6	10.9	13.2	26.5	18.3	23.2	18.8	17.0	12.3
	NOI	8.6	5.0	5.8	9.2	6.8	9.1	7.7	4.9	8.0
	S/N	2.3	2.2	2.3	2.9	2.7	2.9	2.4	3.5	1.5
	GN	0.9	0.6	0.8	1.1	0.7	1.0	0.9	0.9	0.5
	GDB	-1.3	-5.0	-1.9	0.7	-3.2	0.0	-0.7	-1.0	-5.4

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-10

PROCESSING RESULTS, EVENT SIN-064-08AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 0.0 A= 1.0 S= 105			D=-1.8 A=-2.7 S= 335			D=-1.6 A=-2.8 S= 337 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	23.1	29.7	25.3	23.1	29.7	25.3	23.1	29.7	25.3
	NOI	3.0	2.1	2.1	3.0	2.1	2.1	3.0	2.1	2.1
	S/N	7.6	14.3	12.0	7.6	14.3	12.0	7.6	14.3	12.0
A	SIG	32.7	29.3	24.8	27.1	24.7	20.9	30.1	10.2	12.9
	NOI	3.4	2.6	3.1	2.9	2.1	2.5	3.0	1.6	1.9
	S/N	9.7	11.4	8.0	9.4	11.5	8.3	9.9	6.4	6.7
	GN	1.3	0.8	0.7	1.2	0.8	0.7	1.3	0.4	0.6
	GDB	2.1	-2.0	-3.5	1.8	-1.9	-3.2	2.3	-7.0	-5.1
B	SIG	24.8	37.4	27.6	42.4	30.0	21.1	43.9	28.9	21.1
	NOI	2.1	3.1	2.5	3.9	2.2	2.3	3.8	2.6	2.6
	S/N	11.6	12.1	10.9	10.8	13.7	9.2	11.4	11.2	8.1
	GN	0.8	1.6	0.9	1.4	1.0	0.8	1.5	0.8	0.7
	GDB	-1.8	4.0	-0.8	3.0	-0.4	-2.3	3.5	-2.1	-3.4
C	SIG	50.4	50.8	32.1	35.1	36.9	32.0	39.8	34.3	16.0
	NOI	3.3	2.3	2.0	3.8	2.2	2.6	3.6	2.4	2.2
	S/N	15.3	22.2	16.1	9.2	16.6	12.2	11.0	14.0	7.3
	GN	2.0	1.6	1.3	1.2	1.2	1.0	1.4	1.0	0.6
	GDB	6.1	3.8	2.6	1.7	1.3	0.2	3.2	-0.1	-4.2
D	SIG	49.1	52.0	35.2	30.1	37.1	27.2	35.6	28.4	14.7
	NOI	3.2	2.3	2.0	3.7	2.4	2.7	3.7	2.5	1.9
	S/N	15.5	23.1	17.4	8.1	15.7	10.0	9.6	11.6	7.7
	GN	2.0	1.6	1.4	1.1	1.1	0.8	1.3	0.8	0.6
	GDB	6.2	4.2	3.2	0.5	0.8	-1.5	2.0	-1.8	-3.9
E	SIG	46.8	52.4	32.5	27.6	38.9	27.2	35.0	30.6	16.8
	NOI	3.1	2.3	1.9	3.6	2.5	2.9	3.6	2.4	2.2
	S/N	15.0	22.6	17.1	7.6	15.9	9.6	9.6	12.8	7.7
	GN	2.0	1.6	1.4	1.0	1.1	0.8	1.3	0.9	0.6
	GDB	5.9	4.0	3.1	-0.0	0.9	-2.0	2.0	-1.0	-3.8
X	SIG	37.2	57.2	34.3	30.9	45.3	29.5	30.3	30.3	21.7
	NOI	3.6	2.5	1.9	3.6	2.8	2.9	3.4	2.4	2.4
	S/N	10.3	23.2	18.1	8.5	16.2	10.2	9.0	12.8	8.9
	GN	1.4	1.6	1.5	1.1	1.1	0.9	1.2	0.9	0.7
	GDB	2.6	4.2	3.6	1.0	1.1	-1.4	1.5	-1.0	-2.5
Y	SIG	45.2	56.8	33.5	27.5	52.5	42.8	25.1	31.5	15.8
	NOI	3.7	2.3	1.8	3.1	2.6	3.0	2.9	2.2	2.0
	S/N	12.3	24.5	18.5	8.9	19.8	14.5	8.6	14.6	8.0
	GN	1.6	1.7	1.5	1.2	1.4	1.2	1.1	1.0	0.7
	GDB	4.1	4.7	3.8	1.3	2.9	1.6	1.1	0.2	-3.5
Z	SIG	38.9	50.5	29.3	30.8	50.9	27.9	24.5	25.2	15.8
	NOI	3.1	2.1	1.8	3.5	2.6	2.5	2.7	2.1	2.0
	S/N	12.4	24.2	16.3	8.9	19.5	11.1	8.9	11.9	9.0
	GN	1.6	1.7	1.4	1.2	1.4	0.9	1.2	0.8	0.7
	GDB	4.2	4.6	2.7	1.3	2.7	-0.6	1.4	-1.6	-3.5

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-11

PROCESSING RESULTS, EVENT SIN-084-08QC

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D=-1.8	A=-1.7	S= 268	D=-3.6	A=-5.4	S= 683	D=-3.5	A=-5.6	S= 654 *
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	48.8	94.2	77.6	48.8	94.2	77.6	48.8	94.2	77.6
	NOI	2.5	2.4	2.6	2.5	2.4	2.6	2.5	2.4	2.6
	S/N	19.6	39.1	30.0	19.6	39.1	30.0	19.6	39.1	30.0
A	SIG	45.3	68.5	66.7	37.3	39.6	57.7	39.9	25.6	29.7
	NOI	3.0	3.0	3.4	2.6	2.4	2.1	2.8	2.8	3.6
	S/N	15.0	22.7	19.4	14.2	16.4	27.5	14.1	9.2	8.3
	GN	0.8	0.6	0.6	0.7	0.4	0.9	0.7	0.2	0.3
	GDB	-2.3	-4.7	-3.8	-2.8	-7.6	-0.8	-2.9	-12.5	-11.1
B	SIG	74.4	107.5	92.1	61.3	85.3	68.5	60.6	65.6	59.0
	NOI	3.0	2.0	2.6	3.5	2.1	2.1	3.4	3.2	2.6
	S/N	24.7	54.9	35.4	17.5	40.5	32.5	18.0	20.7	22.8
	GN	1.3	1.4	1.2	0.9	1.0	1.1	0.9	0.5	0.8
	GDB	2.0	3.0	1.4	-1.0	0.3	0.7	-0.7	-5.5	-2.4
C	SIG	112.7	154.2	130.1	61.8	98.7	93.1	60.7	60.5	47.9
	NOI	2.6	1.9	2.2	3.3	2.2	2.6	3.0	2.5	2.0
	S/N	43.0	80.0	58.9	18.5	45.4	36.3	20.2	24.5	23.4
	GN	2.2	2.0	2.0	0.9	1.2	1.2	1.0	0.6	0.8
	GDB	6.8	6.2	5.9	-0.5	1.3	1.7	0.3	-4.1	-2.1
D	SIG	106.0	157.6	135.5	71.0	92.7	94.5	59.8	84.7	46.9
	NOI	2.6	2.2	2.4	3.4	2.1	2.3	3.2	2.3	1.9
	S/N	40.9	72.1	55.6	21.1	43.2	41.0	18.4	37.0	24.7
	GN	2.1	1.8	1.9	1.1	1.1	1.4	0.9	0.9	0.8
	GDB	6.4	5.3	5.4	0.6	0.9	2.7	-0.5	-0.5	-1.7
E	SIG	100.9	158.4	124.3	66.4	92.4	96.1	61.1	87.2	51.8
	NOI	2.6	2.2	2.3	3.4	2.2	2.5	3.5	2.4	2.1
	S/N	38.9	71.1	53.1	19.6	42.1	38.2	17.5	35.7	24.6
	GN	2.0	1.8	1.8	1.0	1.1	1.3	0.9	0.9	0.8
	GDB	6.0	5.2	5.0	-0.0	0.6	2.1	-1.0	-0.8	-1.7
X	SIG	86.0	189.8	144.0	71.6	128.4	96.2	64.0	69.7	56.4
	NOI	2.7	2.3	2.3	2.9	2.2	3.0	2.6	2.6	1.9
	S/N	32.3	83.7	63.0	24.4	58.7	31.9	24.6	26.9	29.4
	GN	1.6	2.1	2.1	1.2	1.5	1.1	1.2	0.7	1.0
	GDB	4.4	6.6	6.4	1.9	3.5	0.5	2.0	-3.2	-0.2
Y	SIG	108.2	174.0	137.3	72.1	137.7	117.7	57.6	52.9	45.9
	NOI	2.8	2.1	2.2	2.7	2.1	3.3	2.4	2.1	1.4
	S/N	39.3	81.0	63.8	27.2	65.0	36.1	24.1	25.2	31.6
	GN	2.0	2.1	2.1	1.4	1.7	1.2	1.2	0.6	1.1
	GDB	6.0	6.3	6.6	2.8	4.4	1.6	1.8	-3.8	0.5
Z	SIG	89.4	152.5	119.1	85.7	125.0	96.8	58.8	75.1	46.5
	NOI	2.4	2.2	2.1	3.2	2.4	2.7	2.6	2.0	1.6
	S/N	36.7	69.7	56.2	27.2	53.0	36.1	22.2	38.2	30.8
	GN	1.9	1.8	1.9	1.4	1.4	1.2	1.1	1.0	1.0
	GDB	5.4	5.0	5.5	2.8	2.7	1.6	1.1	-0.2	0.2

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-12

PROCESSING RESULTS, EVENT SIN*181*13AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 4.1 A= 3.2 S= 560			D= 2.3 A=-0.5 S= 258			D= 2.4 A=-0.7 S= 279 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	20.0	31.5	24.8	20.0	31.5	24.8	20.0	31.5	24.8
	NOI	3.6	2.9	4.3	3.6	2.9	4.3	3.6	2.9	4.3
	S/N	5.5	11.0	5.7	5.5	11.0	5.7	5.5	11.0	5.7
A	SIG	23.9	51.4	38.5	21.4	40.5	39.6	22.5	19.3	19.7
	NOI	4.5	4.2	7.9	4.3	2.5	3.2	4.4	3.7	5.6
	S/N	5.3	12.3	4.8	5.0	16.1	12.4	5.1	5.3	3.5
	GN	1.0	1.1	0.8	0.9	1.5	2.2	0.9	0.5	0.6
	GDB	-0.4	0.9	-1.5	-0.9	3.3	6.7	-0.7	-6.5	-4.3
B	SIG	22.2	35.8	33.8	40.7	46.0	36.4	41.9	45.1	44.6
	NOI	4.5	3.3	6.0	5.3	2.6	2.9	5.2	3.3	3.9
	S/N	4.9	11.0	5.7	7.6	17.9	13.0	8.0	13.7	11.4
	GN	0.9	1.0	1.0	1.4	1.6	2.3	1.5	1.2	2.0
	GDB	-1.0	-0.0	-0.1	2.8	4.2	7.1	3.3	1.9	5.9
C	SIG	23.6	23.6	20.0	42.4	44.9	41.0	42.3	51.5	35.8
	NOI	3.4	2.1	3.2	4.6	2.4	3.4	4.6	2.8	2.9
	S/N	7.0	11.3	6.2	9.2	18.6	12.1	9.1	18.5	12.3
	GN	1.3	1.0	1.1	1.7	1.7	2.1	1.7	1.7	2.1
	GDB	2.0	0.2	0.7	4.4	4.5	6.5	4.4	4.5	6.6
D	SIG	23.5	28.5	23.4	42.4	45.2	40.7	44.0	43.0	32.0
	NOI	3.3	2.4	3.7	4.6	2.8	3.4	4.8	2.8	2.5
	S/N	7.0	11.9	6.3	9.3	16.3	11.9	9.1	15.3	12.7
	GN	1.3	1.1	1.1	1.7	1.5	2.1	1.6	1.4	2.2
	GDB	2.1	0.7	0.8	4.5	3.4	6.3	4.3	2.8	6.9
E	SIG	22.8	28.5	21.6	40.3	45.5	42.6	44.2	41.9	33.9
	NOI	3.1	2.7	3.2	4.2	2.8	4.1	4.5	3.4	2.8
	S/N	7.3	10.5	6.7	9.7	16.5	10.4	9.8	12.3	12.1
	GN	1.3	1.0	1.2	1.8	1.5	1.8	1.8	1.1	2.1
	GDB	2.4	-0.4	1.3	4.9	3.5	5.1	5.0	1.0	6.5
X	SIG	23.6	32.5	22.2	27.0	51.6	47.3	27.5	49.1	39.8
	NOI	2.6	2.1	3.1	4.0	2.6	5.3	3.5	2.6	3.3
	S/N	8.9	15.8	7.1	6.7	20.0	8.9	7.9	18.7	12.2
	GN	1.6	1.4	1.2	1.2	1.8	1.5	1.4	1.7	2.1
	GDB	4.2	3.1	1.9	1.7	5.1	3.8	3.1	4.6	6.5
Y	SIG	26.1	25.6	19.0	27.2	45.8	46.3	26.6	46.3	30.8
	NOI	3.1	2.0	2.8	2.6	2.6	5.5	2.4	2.2	2.7
	S/N	8.4	13.1	6.7	10.3	17.8	8.4	11.3	21.0	11.6
	GN	1.5	1.2	1.2	1.9	1.6	1.5	2.0	1.9	2.0
	GDB	3.6	1.5	1.3	5.4	4.2	3.3	6.2	5.6	6.1
Z	SIG	22.0	26.3	19.2	29.8	45.3	37.5	25.3	35.0	29.0
	NOI	2.7	2.0	2.6	3.1	2.6	4.0	2.3	2.4	2.5
	S/N	8.2	13.0	7.3	9.7	17.4	9.3	10.8	14.3	11.5
	GN	1.5	1.2	1.3	1.8	1.6	1.6	2.0	1.3	2.0
	GDB	3.5	1.4	2.1	4.9	3.9	4.2	5.8	2.2	6.0

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-13

PROCESSING RESULTS, EVENT SIN-042-050D

FI LT ER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 3.6 A= 4.7 S= 633			D= 1.8 A= 1.1 S= 230			D= 2.0 A= 0.9 S= 239 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	91.7	119.2	113.8	91.7	119.2	113.8	91.7	119.2	113.8
	NOI	3.6	3.0	2.4	3.6	3.0	2.4	3.6	3.0	2.4
	S/N	25.7	40.3	47.7	25.7	40.3	47.7	25.7	40.3	47.7
A	SIG	119.6	129.3	152.8	95.4	153.4	141.4	108.4	94.7	102.4
	NOI	4.6	2.7	3.0	4.3	2.0	2.2	4.3	2.0	2.0
	S/N	26.3	47.5	50.9	22.0	75.7	62.9	24.9	47.3	52.3
	GN	1.0	1.2	1.1	0.9	1.9	1.3	1.0	1.2	1.1
	GDB	0.2	1.4	0.6	-1.3	5.5	2.4	-0.3	1.4	0.8
B	SIG	87.7	102.8	129.3	189.1	136.6	113.6	181.6	161.6	128.5
	NOI	4.1	2.5	2.5	5.5	2.5	1.9	5.3	2.8	2.1
	S/N	21.4	41.1	51.6	34.4	55.7	60.4	34.0	57.0	61.5
	GN	0.8	1.0	1.1	1.3	1.4	1.3	1.3	1.4	1.3
	GDB	-1.6	0.2	0.7	2.5	2.8	2.0	2.4	3.0	2.2
C	SIG	95.1	115.3	100.4	189.5	141.5	134.6	176.3	134.2	101.0
	NOI	3.7	3.3	2.5	4.3	2.5	2.3	4.5	2.3	1.7
	S/N	25.8	35.0	40.2	44.3	57.1	58.3	39.0	59.6	57.9
	GN	1.0	0.9	0.8	1.7	1.4	1.2	1.5	1.5	1.2
	GDB	0.0	-1.2	-1.5	4.7	3.0	1.7	3.6	3.4	1.7
D	SIG	103.9	128.6	107.2	192.1	135.2	125.7	190.2	137.2	91.3
	NOI	3.5	3.5	2.7	3.9	2.6	2.5	4.6	2.7	1.5
	S/N	29.5	36.6	39.3	48.8	51.1	51.2	41.3	50.3	61.2
	GN	1.1	0.9	0.8	1.9	1.3	1.1	1.6	1.2	1.3
	GDB	1.2	-0.8	-1.7	5.6	2.1	0.6	4.1	1.9	2.2
E	SIG	100.3	130.1	98.0	174.5	136.5	127.8	187.6	123.4	90.3
	NOI	3.4	3.6	2.6	3.7	2.9	2.6	4.3	2.8	1.7
	S/N	29.8	36.2	38.1	47.5	47.0	49.3	43.2	43.5	52.5
	GN	1.2	0.9	0.8	1.8	1.2	1.0	1.7	1.1	1.1
	GDB	1.3	-0.9	-2.0	5.3	1.3	0.3	4.5	0.7	0.9
X	SIG	103.8	111.2	75.6	122.1	129.5	136.2	107.2	166.6	114.6
	NOI	3.2	4.2	2.9	3.8	3.5	2.8	3.3	2.5	2.1
	S/N	32.2	26.4	26.1	32.1	37.1	49.2	32.6	67.4	55.4
	GN	1.3	0.7	0.5	1.3	0.9	1.0	1.3	1.7	1.2
	GDB	2.0	-3.7	-5.2	1.9	-0.7	0.3	2.1	4.5	1.3
Y	SIG	103.2	123.9	81.5	123.0	110.3	124.1	105.3	120.8	98.3
	NOI	3.4	3.6	2.7	2.9	3.4	3.1	2.5	2.0	1.6
	S/N	30.1	34.3	30.5	42.4	32.9	39.9	41.9	59.9	61.9
	GN	1.2	0.8	0.6	1.7	0.8	0.8	1.6	1.5	1.3
	GDB	1.4	-1.4	-3.9	4.4	-1.8	-1.5	4.3	3.4	2.3
Z	SIG	99.9	120.6	77.1	135.7	109.9	113.7	107.5	131.0	90.7
	NOI	3.1	3.6	2.5	3.5	3.5	2.6	2.4	2.4	1.5
	S/N	32.1	33.4	30.3	38.5	31.1	43.4	44.4	55.3	61.0
	GN	1.3	0.8	0.6	1.5	0.8	0.9	1.7	1.4	1.3
	GDB	1.9	-1.6	-3.9	3.5	-2.3	-0.8	4.8	2.7	2.1

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-14

PROCESSING RESULTS, EVENT SIN-047-230C

FILTER	REF / DIF / COM	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 1.1 A= 2.9 S= 315			D= 0.7 A=-0.9 S= 117			D=-0.5 A= 1.0 S= 118 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	32.7	54.4	48.8	32.7	54.4	48.8	32.7	54.4	48.8
	NOI	5.5	3.2	3.9	5.5	3.2	3.9	5.5	3.2	3.9
	S/N	6.0	17.2	12.6	6.0	17.2	12.6	6.0	17.2	12.6
A	SIG	51.3	84.5	86.0	46.2	98.4	80.5	48.8	39.2	41.2
	NOI	6.0	3.4	5.3	5.6	2.6	3.8	5.6	2.7	4.0
	S/N	8.6	24.7	16.1	8.3	37.3	21.4	8.7	14.6	10.2
	GN	1.4	1.4	1.3	1.4	2.2	1.7	1.5	0.8	0.8
	GDB	3.2	3.2	2.2	2.9	6.7	4.6	3.3	-1.4	-1.8
B	SIG	45.4	67.5	58.3	66.8	69.6	49.4	71.6	115.2	87.5
	NOI	5.3	3.1	4.7	7.8	2.6	3.7	7.2	3.6	3.8
	S/N	8.6	22.0	12.3	8.6	26.7	13.3	9.9	32.4	22.7
	GN	1.4	1.3	1.0	1.4	1.6	1.1	1.7	1.9	1.8
	GDB	3.2	2.2	-0.2	3.2	3.8	0.5	4.4	5.5	5.1
C	SIG	42.6	61.3	55.6	69.9	70.8	59.1	65.8	115.0	69.3
	NOI	5.5	3.8	3.6	6.6	2.5	4.2	6.3	2.9	2.9
	S/N	7.8	16.3	15.3	10.5	27.8	14.1	10.4	39.3	24.2
	GN	1.3	0.9	1.2	1.8	1.6	1.1	1.7	2.3	1.9
	GDB	2.4	-0.5	1.7	5.0	4.2	1.0	4.8	7.2	5.7
D	SIG	43.8	66.7	61.8	66.3	69.7	52.7	71.7	94.7	63.2
	NOI	5.4	3.8	4.2	6.8	2.6	4.1	6.6	3.0	2.8
	S/N	8.1	17.4	14.8	9.8	27.3	12.9	10.9	31.4	22.8
	GN	1.4	1.0	1.2	1.6	1.6	1.0	1.8	1.8	1.8
	GDB	2.6	0.1	1.4	4.3	4.0	0.2	5.2	5.2	5.2
E	SIG	40.7	67.1	57.0	66.8	71.5	55.5	71.3	95.8	63.3
	NOI	5.1	3.9	3.8	6.3	2.7	4.3	6.1	3.3	2.8
	S/N	8.0	17.1	15.0	10.6	26.0	13.0	11.7	29.5	22.9
	GN	1.3	1.0	1.2	1.8	1.5	1.0	2.0	1.7	1.8
	GDB	2.6	-0.1	1.5	5.0	3.6	0.2	5.9	4.7	5.2
X	SIG	35.2	60.6	42.8	43.4	82.4	81.5	37.4	101.0	77.7
	NOI	5.7	4.3	4.0	5.9	3.6	4.8	5.2	3.0	3.5
	S/N	6.1	14.1	10.7	7.3	23.0	17.1	7.2	33.8	22.5
	GN	1.0	0.8	0.9	1.2	1.3	1.4	1.2	2.0	1.8
	GDB	0.3	-1.7	-1.4	1.8	2.5	2.7	1.7	5.9	5.0
Y	SIG	34.7	69.9	53.3	34.0	71.9	72.7	30.9	98.5	63.7
	NOI	5.5	4.1	3.6	4.8	3.5	5.1	4.2	2.5	2.5
	S/N	6.2	17.1	14.7	7.0	20.6	14.3	7.3	39.2	25.5
	GN	1.0	1.0	1.2	1.2	1.2	1.1	1.2	2.3	2.0
	GDB	0.4	-0.0	1.3	1.4	1.6	1.1	1.8	7.2	6.1
Z	SIG	32.2	65.7	51.7	39.9	75.4	62.9	34.4	81.4	61.7
	NOI	5.0	3.7	3.5	6.0	3.5	4.1	4.3	2.5	2.7
	S/N	6.5	18.0	14.8	6.6	21.5	15.3	7.9	31.9	23.1
	GN	1.1	1.0	1.2	1.1	1.3	1.2	1.3	1.9	1.8
	GDB	0.8	0.4	1.4	0.9	1.9	1.7	2.5	5.4	5.3

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-15

PROCESSING RESULTS, EVENT SIN-064-04AL

FI	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
LT	DIF	D= 2.9	A= 3.6	S= 494	D= 1.1	A=-0.1	S= 127	D= 1.3	A=-0.2	S= 147 *
ER	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	36.7	54.6	44.2	36.7	54.6	44.2	36.7	54.6	44.2
	NOI	4.1	3.0	3.5	4.1	3.0	3.5	4.1	3.0	3.5
	S/N	9.0	18.2	12.7	9.0	18.2	12.7	9.0	18.2	12.7
A	SIG	54.4	83.1	80.9	47.1	78.3	57.7	52.1	32.9	33.9
	NOI	4.5	3.5	4.8	3.8	2.7	3.8	4.1	2.3	3.6
	S/N	12.2	23.6	16.9	12.3	28.9	15.3	12.6	14.5	9.4
	GN	1.3	1.3	1.3	1.4	1.6	1.2	1.4	0.8	0.7
	GDB	2.6	2.2	2.5	2.7	4.0	1.6	2.9	-2.0	-2.6
B	SIG	44.3	69.7	69.9	91.7	88.1	59.2	92.2	91.7	66.6
	NOI	4.6	3.2	4.8	5.8	2.9	3.4	5.8	3.4	3.9
	S/N	9.6	21.5	14.6	15.7	30.6	17.2	16.0	26.9	17.1
	GN	1.1	1.2	1.1	1.7	1.7	1.3	1.8	1.5	1.3
	GDB	0.5	1.4	1.2	4.8	4.5	2.6	5.0	3.4	2.6
C	SIG	55.5	49.8	39.6	97.8	88.5	69.7	94.6	97.4	53.2
	NOI	4.2	3.5	3.6	4.9	3.0	3.8	4.8	2.8	3.0
	S/N	13.2	14.3	11.0	19.9	29.3	18.2	19.8	34.6	17.6
	GN	1.5	0.8	0.9	2.2	1.6	1.4	2.2	1.9	1.4
	GDB	3.3	-2.1	-1.3	6.8	4.1	3.1	6.8	5.6	2.9
D	SIG	55.1	57.3	50.0	98.6	84.2	75.6	104.9	78.0	47.7
	NOI	4.3	3.7	3.8	4.6	3.1	3.8	5.0	3.1	2.8
	S/N	12.7	15.6	13.3	21.3	26.9	19.7	20.8	25.1	16.9
	GN	1.4	0.9	1.0	2.4	1.5	1.6	2.3	1.4	1.3
	GDB	3.0	-1.4	0.4	7.4	3.4	3.8	7.3	2.9	2.5
E	SIG	53.1	57.1	46.2	94.0	85.6	77.3	103.6	73.6	50.2
	NOI	4.0	3.9	3.5	4.4	3.4	4.3	5.1	3.5	3.1
	S/N	13.4	14.6	13.1	21.3	24.9	17.9	20.2	21.0	16.0
	GN	1.5	0.8	1.0	2.4	1.4	1.4	2.2	1.2	1.2
	GDB	3.4	-1.9	0.3	7.4	2.7	3.0	7.0	1.2	2.0
X	SIG	64.7	53.9	27.8	57.6	96.8	74.5	53.5	94.8	60.9
	NOI	4.0	3.9	3.5	5.3	3.7	4.5	4.8	3.1	3.5
	S/N	16.2	13.9	8.0	10.9	26.0	16.6	11.1	30.7	17.2
	GN	1.8	0.8	0.6	1.2	1.4	1.3	1.2	1.7	1.4
	GDB	5.1	-2.4	-4.0	1.6	3.1	2.3	1.8	4.5	2.6
Y	SIG	55.6	55.4	34.0	63.4	90.5	78.3	56.6	84.5	47.1
	NOI	4.1	3.8	3.5	3.6	3.5	4.7	3.5	2.6	2.7
	S/N	13.4	14.5	9.7	17.4	26.0	16.8	16.4	32.8	17.2
	GN	1.5	0.8	0.8	1.9	1.4	1.3	1.8	1.8	1.4
	GDB	3.4	-2.0	-2.3	5.7	3.1	2.4	5.2	5.1	2.7
Z	SIG	50.8	53.1	38.2	74.4	79.9	72.1	60.9	65.1	43.5
	NOI	3.7	3.6	3.1	3.8	3.6	4.0	3.3	2.9	2.7
	S/N	13.8	14.6	12.4	19.4	22.2	18.1	18.4	23.0	16.2
	GN	1.5	0.8	1.0	2.1	1.2	1.4	2.0	1.3	1.3
	GDB	3.7	-1.9	-0.2	6.6	1.7	3.1	6.2	2.0	2.1

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-16

PROCESSING RESULTS, EVENT SIN-080-21AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 2.9	A= 2.8	S= 428	D= 1.1	A=-0.9	S= 153	D= 1.2	A=-1.1	S= 177 *
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	8.4	8.0	7.5	8.4	8.0	7.5	8.4	8.0	7.5
	NOI	2.4	2.0	1.8	2.4	2.0	1.8	2.4	2.0	1.8
	S/N	3.5	4.0	4.1	3.5	4.0	4.1	3.5	4.0	4.1
A	SIG	7.3	10.0	10.2	5.9	8.8	8.1	6.1	3.8	5.4
	NOI	2.8	2.2	2.5	2.5	1.8	1.8	2.6	1.4	2.1
	S/N	2.6	4.6	4.0	2.4	4.9	4.4	2.4	2.7	2.6
	GN	0.8	1.1	1.0	0.7	1.2	1.1	0.7	0.7	0.6
	GDB	-2.5	1.2	-0.2	-3.4	1.7	0.6	-3.4	-3.6	-3.9
B	SIG	7.5	8.2	10.9	13.0	7.6	8.6	11.6	9.1	8.4
	NOI	2.4	2.1	2.2	3.1	1.9	1.7	3.0	2.2	1.9
	S/N	3.1	3.8	4.9	4.2	4.1	4.9	3.9	4.1	4.3
	GN	0.9	1.0	1.2	1.2	1.0	1.2	1.1	1.0	1.0
	GDB	-1.1	-0.4	1.5	1.7	0.1	1.5	1.0	0.1	0.4
C	SIG	9.0	9.1	7.8	10.9	7.7	9.3	10.8	10.8	6.3
	NOI	2.5	2.2	1.7	3.0	1.8	1.9	2.8	1.8	1.5
	S/N	3.6	4.2	4.7	3.6	4.4	4.8	3.8	5.9	4.1
	GN	1.0	1.0	1.1	1.0	1.1	1.2	1.1	1.5	1.0
	GDB	0.3	0.4	1.2	0.3	0.7	1.3	0.8	3.4	0.0
D	SIG	8.1	8.5	8.5	9.7	7.7	8.8	9.9	9.5	7.3
	NOI	2.4	2.4	1.8	3.0	1.7	1.8	2.9	2.0	1.5
	S/N	3.3	3.5	4.7	3.2	4.4	4.8	3.4	4.8	4.9
	GN	1.0	0.9	1.1	0.9	1.1	1.2	1.0	1.2	1.2
	GDB	-0.4	-1.2	1.1	-0.7	0.8	1.3	-0.3	1.6	1.6
E	SIG	8.0	8.6	7.5	9.5	8.2	9.5	9.8	10.5	7.2
	NOI	2.3	2.5	1.6	2.8	1.7	2.0	2.7	2.0	1.4
	S/N	3.5	3.4	4.8	3.3	4.7	4.8	3.7	5.3	4.9
	GN	1.0	0.8	1.2	1.0	1.2	1.2	1.1	1.3	1.2
	GDB	0.1	-1.5	1.2	-0.4	1.3	1.4	0.4	2.4	1.6
X	SIG	8.9	8.8	9.0	11.6	11.4	11.9	10.2	9.2	9.5
	NOI	2.4	2.5	1.5	2.5	2.5	2.2	2.1	2.1	1.7
	S/N	3.6	3.6	5.9	4.6	4.6	5.5	4.8	4.5	5.6
	GN	1.0	0.9	1.4	1.3	1.1	1.3	1.4	1.1	1.4
	GDB	0.4	-1.0	3.1	2.4	1.1	2.5	2.7	0.9	2.7
Y	SIG	9.0	9.5	7.1	8.2	11.2	12.2	8.3	10.1	7.0
	NOI	2.5	2.5	1.6	2.3	2.2	2.3	2.1	1.7	1.3
	S/N	3.5	3.8	4.5	3.6	5.1	5.4	4.0	5.8	5.4
	GN	1.0	1.0	1.1	1.0	1.3	1.3	1.2	1.5	1.3
	GDB	0.1	-0.4	0.7	0.2	2.1	2.3	1.3	3.2	2.3
Z	SIG	7.3	7.7	7.5	9.2	10.6	8.5	6.8	8.7	8.1
	NOI	2.2	2.4	1.5	2.6	2.1	1.8	1.9	1.8	1.3
	S/N	3.3	3.2	5.1	3.6	5.1	4.7	3.7	4.8	6.1
	GN	0.9	0.8	1.2	1.0	1.3	1.1	1.1	1.2	1.5
	GDB	-0.6	-1.9	1.9	0.3	2.1	1.2	0.4	1.5	3.4

* D=DELTA DIFF(DEG)   A=AZIMUTH DIFF(DEG)   S=DISTANCE TO REF(KM)

TABLE A-17

PROCESSING RESULTS, EVENT SIN-154-06AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 0.7 A= 2.7 S= 290			D=-1.1 A=-1.0 S= 154			D=-0.9 A=-1.1 S= 151 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	27.3	13.4	13.3	27.3	13.4	13.3	27.3	13.4	13.3
	NOI	3.4	3.0	2.9	3.4	3.0	2.9	3.4	3.0	2.9
	S/N	8.0	4.5	4.5	8.0	4.5	4.5	8.0	4.5	4.5
A	SIG	44.0	12.5	20.2	36.9	9.8	16.6	40.6	9.0	10.5
	NOI	2.4	2.4	2.6	2.6	1.8	2.6	2.1	1.7	2.0
	S/N	18.3	5.1	7.8	14.2	5.3	6.4	19.6	4.9	5.1
	GN	2.3	1.1	1.7	1.8	1.2	1.4	2.5	1.1	1.1
	GDB	7.2	1.1	4.7	5.0	1.4	3.0	7.8	0.5	1.1
B	SIG	51.2	13.9	18.9	52.9	15.2	14.2	52.8	15.5	19.0
	NOI	2.4	2.6	2.5	3.4	2.1	2.2	2.9	2.4	2.1
	S/N	21.5	5.3	7.5	15.5	7.1	6.3	17.9	6.3	9.0
	GN	2.7	1.2	1.7	1.9	1.6	1.4	2.3	1.4	2.0
	GDB	8.6	1.4	4.5	5.8	4.0	2.9	7.1	3.0	6.0
C	SIG	41.6	17.9	13.8	52.8	13.5	16.4	47.9	12.6	14.7
	NOI	3.6	4.2	3.7	3.0	2.4	3.0	2.9	2.1	1.7
	S/N	11.4	4.2	3.8	17.6	5.6	5.5	17.3	6.2	8.6
	GN	1.4	0.9	0.8	2.2	1.2	1.2	2.2	1.4	1.9
	GDB	3.2	-0.6	-1.6	6.9	1.8	1.7	6.9	2.7	5.6
D	SIG	41.9	19.3	15.4	53.4	13.0	15.0	52.7	14.7	11.5
	NOI	3.7	4.5	4.1	3.5	2.7	3.5	2.8	2.4	1.9
	S/N	11.3	4.3	3.7	15.1	4.9	4.3	18.8	6.2	6.3
	GN	1.4	0.9	0.8	1.9	1.1	1.0	2.4	1.4	1.4
	GDB	3.0	-0.5	-1.7	5.6	0.7	-0.4	7.5	2.8	2.9
E	SIG	39.7	19.9	14.6	50.7	12.6	15.4	52.3	18.9	12.0
	NOI	3.5	4.5	3.8	3.9	2.8	3.7	2.9	3.3	2.6
	S/N	11.3	4.4	3.9	13.0	4.5	4.2	18.2	5.7	4.7
	GN	1.4	1.0	0.9	1.6	1.0	0.9	2.3	1.2	1.0
	GDB	3.0	-0.2	-1.3	4.3	-0.1	-0.7	7.2	2.1	0.3
X	SIG	24.7	21.0	16.8	36.1	21.0	25.9	34.7	14.0	19.3
	NOI	3.8	5.2	4.1	3.3	3.4	2.9	2.5	2.2	2.1
	S/N	6.5	4.1	4.1	10.9	6.2	8.8	13.8	6.2	9.0
	GN	0.8	0.9	0.9	1.4	1.4	1.9	1.7	1.4	2.0
	GDB	-1.8	-0.9	-0.9	2.8	2.8	5.8	4.8	2.8	6.0
Y	SIG	34.1	18.9	14.3	26.8	18.3	25.6	20.6	11.1	14.3
	NOI	3.7	4.8	3.9	2.6	3.7	3.9	2.3	1.9	1.7
	S/N	9.1	3.9	3.7	10.3	5.0	6.5	9.1	6.0	8.4
	GN	1.1	0.9	0.8	1.3	1.1	1.4	1.1	1.3	1.9
	GDB	1.2	-1.2	-1.8	2.3	0.9	3.2	1.1	2.5	5.4
Z	SIG	30.3	17.7	13.8	31.4	14.4	18.5	21.9	12.4	11.3
	NOI	3.5	4.3	3.7	3.5	4.1	3.8	2.3	2.1	1.9
	S/N	8.7	4.1	3.7	8.9	3.5	4.9	9.6	6.0	6.1
	GN	1.1	0.9	0.8	1.1	0.9	1.1	1.2	1.3	1.4
	GDB	0.7	-0.8	-1.8	1.0	-2.1	0.7	1.6	2.4	2.6

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-18

PROCESSING RESULTS, EVENT SIN/170/08AL

FILTER	REF	SIN-002-1CAL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 5.3	A= 7.1	S= 941	D= 3.5	A= 3.4	S= 525	D= 3.6	A= 3.3	S= 528 *
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	7.6	7.5	7.9	7.6	7.5	7.9	7.6	7.5	7.9
	NOI	2.8	2.6	2.8	2.8	2.6	2.8	2.8	2.6	2.8
	S/N	2.7	2.9	2.9	2.7	2.9	2.9	2.7	2.9	2.9
A	SIG	7.9	7.5	13.0	5.3	5.7	8.2	6.0	4.9	8.7
	NOI	2.8	3.1	4.4	2.4	2.9	2.9	2.7	1.9	2.9
	S/N	2.8	2.4	2.9	2.2	1.9	2.8	2.3	2.7	3.0
	GN	1.0	0.8	1.0	0.8	0.7	1.0	0.8	0.9	1.0
	GDB	0.1	-1.7	0.2	-1.9	-3.5	-0.1	-1.6	-0.7	0.3
B	SIG	8.2	7.4	8.9	8.9	6.3	7.0	9.0	8.9	9.6
	NOI	2.8	2.8	2.6	3.7	2.9	2.3	3.7	3.1	2.9
	S/N	3.0	2.6	2.5	2.4	2.2	3.0	2.4	2.9	3.3
	GN	1.1	0.9	0.9	0.9	0.8	1.1	0.9	1.0	1.1
	GDB	0.6	-0.9	-1.3	-1.1	-2.3	0.5	-1.1	-0.0	1.1
C	SIG	9.6	7.0	6.4	9.3	6.6	8.2	8.4	6.5	7.7
	NOI	3.0	2.7	2.4	3.2	2.8	2.5	3.1	2.6	2.5
	S/N	3.2	2.6	2.7	2.9	2.4	3.3	2.7	2.5	3.1
	GN	1.2	0.9	0.9	1.1	0.8	1.1	1.0	0.9	1.1
	GDB	1.4	-1.0	-0.5	0.5	-1.8	1.1	-0.1	-1.4	0.7
D	SIG	9.2	7.7	6.4	9.1	6.5	9.1	8.8	6.5	6.3
	NOI	2.9	2.9	2.5	3.1	2.9	2.5	3.2	2.9	2.2
	S/N	3.1	2.7	2.5	2.9	2.3	3.7	2.7	2.3	2.8
	GN	1.1	0.9	0.9	1.1	0.8	1.3	1.0	0.8	1.0
	GDB	1.2	-0.6	-1.1	0.6	-2.1	2.2	-0.1	-2.1	-0.1
E	SIG	8.9	8.4	5.8	8.7	6.6	9.9	8.6	7.5	6.9
	NOI	2.8	2.9	2.3	3.0	2.9	2.7	3.2	2.9	2.2
	S/N	3.2	2.9	2.6	2.9	2.3	3.7	2.7	2.6	3.1
	GN	1.1	1.0	0.9	1.1	0.8	1.3	1.0	0.9	1.1
	GDB	1.2	0.0	-1.0	0.5	-2.1	2.2	-0.2	-0.9	0.8
X	SIG	8.4	6.8	6.2	11.6	7.8	10.7	10.9	6.5	7.9
	NOI	3.1	3.2	2.1	3.4	2.9	3.4	3.2	3.1	2.7
	S/N	2.7	2.1	3.0	3.4	2.7	3.1	3.5	2.1	2.9
	GN	1.0	0.7	1.0	1.2	0.9	1.1	1.3	0.7	1.0
	GDB	-0.0	-2.7	0.4	1.5	-0.6	0.7	2.0	-2.9	0.1
Y	SIG	10.5	7.1	6.7	6.9	7.0	11.0	6.8	5.6	6.4
	NOI	3.1	3.0	2.2	2.6	2.7	3.3	2.3	2.5	2.3
	S/N	3.3	2.4	3.1	2.7	2.6	3.3	3.0	2.2	2.8
	GN	1.2	0.8	1.1	1.0	0.9	1.2	1.1	0.8	1.0
	GDB	1.7	-1.7	0.6	-0.2	-0.8	1.2	0.7	-2.3	-0.3
Z	SIG	8.8	7.4	6.1	6.9	7.9	8.5	6.1	6.2	5.2
	NOI	2.8	2.7	1.9	2.9	2.7	2.6	2.3	2.6	2.1
	S/N	3.2	2.7	3.2	2.4	2.9	3.2	2.6	2.4	2.5
	GN	1.2	0.9	1.1	0.9	1.0	1.1	0.9	0.8	0.9
	GDB	1.4	-0.5	0.9	-1.1	0.1	1.0	-0.5	-1.6	-1.1

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-19

PROCESSING RESULTS, EVENT SIN*194*02AL

FILTER	REF	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 5.0	A= 6.3	S= 853	D= 3.2	A= 2.6	S= 446	D= 3.4	A= 2.4	S= 452 *
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	10.6	11.0	9.0	10.6	11.0	9.0	10.6	11.0	9.0
	NOI	4.7	4.0	4.8	4.7	4.0	4.8	4.7	4.0	4.8
	S/N	2.3	2.8	1.9	2.3	2.8	1.9	2.3	2.8	1.9
A	SIG	12.5	11.4	12.9	10.9	8.3	8.3	11.6	8.9	10.0
	NOI	6.3	5.0	7.4	5.5	3.6	4.2	5.9	4.2	6.2
	S/N	2.0	2.3	1.7	2.0	2.3	2.0	2.0	2.1	1.6
	GN	0.9	0.8	0.9	0.9	0.8	1.1	0.9	0.8	0.9
	GDB	-1.1	-1.8	-0.7	-1.2	-1.6	0.6	-1.2	-2.4	-1.2
B	SIG	11.0	7.7	9.4	12.9	6.7	8.0	11.9	9.2	8.5
	NOI	6.0	3.8	5.2	6.8	3.1	3.8	6.5	5.0	5.1
	S/N	1.8	2.0	1.8	1.9	2.2	2.1	1.8	1.8	1.7
	GN	0.8	0.7	1.0	0.8	0.8	1.1	0.8	0.7	0.9
	GDB	-1.8	-2.7	-0.3	-1.5	-2.1	0.9	-1.7	-3.6	-1.1
C	SIG	9.5	9.7	7.6	10.7	7.0	8.9	11.0	7.4	7.4
	NOI	4.5	4.2	4.3	5.7	2.9	4.5	5.4	3.8	4.2
	S/N	2.1	2.3	1.8	1.9	2.4	2.0	2.0	1.9	1.7
	GN	0.9	0.8	0.9	0.8	0.9	1.1	0.9	0.7	0.9
	GDB	-0.6	-1.7	-0.5	-1.5	-1.4	0.5	-0.8	-2.1	-0.6
D	SIG	9.5	10.4	7.9	11.6	7.6	7.8	11.7	8.9	6.7
	NOI	4.4	3.8	4.4	5.4	2.9	3.8	5.5	2.8	2.9
	S/N	2.2	2.7	1.8	2.2	2.7	2.1	2.1	2.4	1.7
	GN	1.0	1.0	1.0	1.0	1.0	1.1	0.9	0.8	0.9
	GDB	-0.4	-0.2	-0.4	-0.4	-0.4	0.8	-0.5	-1.5	-0.7
E	SIG	11.7	10.4	7.4	14.3	7.7	9.3	15.3	8.7	6.7
	NOI	4.0	3.9	3.8	4.8	2.9	4.2	5.4	3.5	3.7
	S/N	3.0	2.6	2.0	3.0	2.7	2.2	2.8	2.5	2.0
	GN	1.3	0.9	1.1	1.3	1.0	1.2	1.3	0.9	1.1
	GDB	2.4	-0.5	0.4	2.4	-0.3	1.5	2.1	-1.1	0.7
X	SIG	9.3	10.9	6.3	11.4	10.1	9.6	8.7	9.4	7.7
	NOI	3.9	4.3	4.1	4.4	3.6	6.0	3.6	3.9	4.1
	S/N	2.4	2.5	1.5	2.6	2.8	1.6	2.4	2.4	1.9
	GN	1.1	0.9	0.8	1.1	1.0	0.8	1.1	0.9	1.0
	GDB	0.5	-0.8	-1.8	1.1	-0.0	-1.5	0.6	-1.3	0.0
Y	SIG	10.8	10.5	6.8	8.9	10.6	11.4	6.8	7.9	6.7
	NOI	4.4	4.0	4.1	3.4	3.5	5.5	2.7	2.9	3.2
	S/N	2.5	2.6	1.6	2.6	3.0	2.1	2.6	2.7	2.1
	GN	1.1	0.9	0.9	1.2	1.1	1.1	1.1	1.0	1.1
	GDB	0.8	-0.5	-1.1	1.3	0.6	0.9	1.1	-0.3	1.1
Z	SIG	9.3	9.7	6.8	9.8	10.1	9.5	7.7	7.6	6.7
	NOI	3.6	3.7	3.3	4.1	3.4	4.4	2.7	2.8	2.9
	S/N	2.6	2.7	2.0	2.4	3.0	2.1	2.9	2.8	2.3
	GN	1.1	1.0	1.1	1.1	1.1	1.1	1.3	1.0	1.2
	GDB	1.1	-0.4	0.8	0.6	0.6	1.2	2.2	0.1	1.7

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-20

PROCESSING RESULTS, EVENT SIN-060-20AL

FILTER	REF DIF COM	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
		D= 5.3 A= 7.1 S= 941			D= 3.5 A= 3.4 S= 525			D= 3.6 A= 3.3 S= 528 *		
		LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	16.8	19.4	17.9	16.8	19.4	17.9	16.8	19.4	17.9
	NOI	5.6	7.4	6.7	5.6	7.4	6.7	5.6	7.4	6.7
	S/N	3.0	2.6	2.7	3.0	2.6	2.7	3.0	2.6	2.7
A	SIG	18.2	23.0	22.5	15.7	14.5	22.9	16.2	17.3	19.4
	NOI	7.0	10.8	9.6	6.1	6.1	7.2	6.4	10.5	6.8
	S/N	2.6	2.1	2.3	2.6	2.4	3.2	2.5	1.6	2.8
	GN	0.9	0.8	0.9	0.9	0.9	1.2	0.8	0.6	1.1
	GDB	-1.2	-1.7	-1.2	-1.3	-0.8	1.4	-1.5	-4.0	0.5
B	SIG	24.3	21.2	16.6	23.6	17.5	16.4	23.4	21.3	21.0
	NOI	8.5	7.5	5.9	7.3	6.0	6.8	7.1	10.3	7.7
	S/N	2.9	2.8	2.8	3.2	2.9	2.4	3.3	2.1	2.7
	GN	1.1	1.1	0.9	1.1	1.1	0.9	1.1	0.8	1.0
	GDB	0.6	0.7	-0.6	0.6	1.0	-0.9	0.8	-2.1	0.1
C	SIG	20.6	20.2	23.1	20.8	19.2	20.2	18.9	16.8	16.8
	NOI	6.3	6.1	6.4	6.9	5.4	6.8	6.4	7.5	6.5
	S/N	3.3	3.3	3.6	3.0	3.6	3.0	3.0	2.3	2.6
	GN	1.1	1.3	1.3	1.0	1.4	1.1	1.0	0.9	1.0
	GDB	0.7	2.0	2.5	0.1	2.8	0.9	-0.1	-1.3	-0.3
D	SIG	20.9	21.7	22.8	23.8	18.7	20.4	24.3	16.7	14.3
	NOI	6.3	5.8	6.6	6.8	5.3	6.5	6.7	7.3	6.3
	S/N	3.3	3.7	3.4	3.5	3.5	3.2	3.6	2.3	2.3
	GN	1.1	1.4	1.3	1.2	1.3	1.2	1.2	0.9	0.8
	GDB	0.8	3.1	2.1	1.3	2.5	1.4	1.7	-1.1	-1.5
E	SIG	20.1	22.9	21.1	22.9	19.1	23.2	23.7	30.2	18.6
	NOI	6.1	5.6	6.1	6.3	5.8	6.6	6.5	6.9	6.1
	S/N	3.3	4.1	3.4	3.7	3.3	3.5	3.6	4.3	3.1
	GN	1.1	1.6	1.3	1.2	1.3	1.3	1.2	1.7	1.1
	GDB	0.8	3.9	2.1	1.7	2.0	2.3	1.6	4.4	1.2
X	SIG	20.9	24.9	21.7	20.3	28.5	19.9	16.8	20.4	16.9
	NOI	6.4	5.4	6.1	6.1	6.8	8.9	5.6	6.8	7.0
	S/N	3.3	4.6	3.6	3.3	4.2	2.2	3.0	3.0	2.4
	GN	1.1	1.8	1.3	1.1	1.6	0.8	1.0	1.2	0.9
	GDB	0.8	5.0	2.4	0.9	4.1	-1.6	-0.1	1.2	-0.9
Y	SIG	24.2	21.8	22.1	16.3	25.3	22.8	14.6	14.8	13.3
	NOI	6.7	6.1	6.5	5.5	6.4	8.3	4.7	5.1	5.7
	S/N	3.6	3.6	3.4	3.0	4.0	2.7	3.1	2.9	2.3
	GN	1.2	1.4	1.3	1.0	1.5	1.0	1.0	1.1	0.9
	GDB	1.6	2.8	2.0	-0.1	3.6	0.1	0.2	0.9	-1.2
Z	SIG	22.0	21.7	20.0	16.7	22.1	19.6	14.0	14.4	15.6
	NOI	5.8	4.9	5.7	6.3	6.2	6.7	4.7	5.7	5.7
	S/N	3.8	4.4	3.5	2.6	3.6	2.9	3.0	2.5	2.7
	GN	1.3	1.7	1.3	0.9	1.4	1.1	1.0	1.0	1.0
	GDB	2.0	4.5	2.3	-1.1	2.7	0.7	-0.1	-0.4	0.1

* D=DELTA DIFF(DEG) A=AZIMUTH DIFF(DEG) S=DISTANCE TO REF(KM)

TABLE A-21

PROCESSING RESULTS, EVENT SIN-076-21AL

FILTER	REF / DIF / COM	SIN-002-10AL			SIN/168/15AL			SIN/170/17AL		
	DIF	D= 4.2 A= 0.5 S= 473			D= 2.4 A=-3.2 S= 429			D= 2.6 A=-3.4 S= 452 *		
	COM	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R	LQ-T	LR-V	LR-R
BP	SIG	21.3	12.5	18.2	21.3	12.5	18.2	21.3	12.5	18.2
	NOI	5.7	4.5	5.6	5.7	4.5	5.6	5.7	4.5	5.6
	S/N	3.8	2.8	3.3	3.8	2.8	3.3	3.8	2.8	3.3
A	SIG	20.3	12.7	22.9	17.7	11.3	19.2	18.2	9.7	23.4
	NOI	5.0	5.0	6.9	4.5	4.5	5.8	4.5	3.4	5.0
	S/N	4.0	2.6	3.3	3.9	2.5	3.3	4.1	2.8	4.7
	GN	1.1	0.9	1.0	1.0	0.9	1.0	1.1	1.0	1.4
	GDB	0.6	-0.8	0.1	0.4	-0.9	0.2	0.7	0.1	3.2
B	SIG	16.9	12.7	15.4	26.4	10.6	15.4	24.4	16.1	16.4
	NOI	5.6	4.6	6.4	7.2	4.4	4.6	6.8	5.5	5.9
	S/N	3.0	2.8	2.4	3.7	2.4	3.4	3.6	2.9	2.8
	GN	0.8	1.0	0.7	1.0	0.9	1.0	1.0	1.0	0.9
	GDB	-1.9	-0.1	-2.7	-0.3	-1.4	0.3	-0.4	0.4	-1.4
C	SIG	16.8	16.5	13.3	20.3	12.0	17.9	18.4	12.7	13.2
	NOI	7.2	5.1	6.5	7.1	4.6	5.7	6.3	4.7	5.1
	S/N	2.3	3.3	2.0	2.8	2.6	3.1	2.9	2.7	2.6
	GN	0.6	1.2	0.6	0.8	0.9	1.0	0.8	1.0	0.8
	GDB	-4.1	1.3	-4.0	-2.4	-0.6	-0.3	-2.2	-0.4	-2.1
D	SIG	15.8	18.3	16.7	20.9	12.0	15.2	22.1	13.4	13.1
	NOI	6.6	5.6	6.9	7.2	4.3	6.7	6.4	4.5	4.4
	S/N	2.4	3.3	2.4	2.9	2.8	2.2	3.5	3.0	3.0
	GN	0.6	1.2	0.7	0.8	1.0	0.7	0.9	1.1	0.9
	GDB	-4.0	1.3	-2.6	-2.2	-0.2	-3.3	-0.8	0.5	-0.8
E	SIG	18.3	15.5	18.1	19.2	12.8	16.4	20.6	13.1	13.1
	NOI	6.4	6.3	5.8	7.3	4.6	7.3	6.5	5.0	4.9
	S/N	2.9	2.5	3.1	2.6	2.8	2.2	3.2	2.6	2.7
	GN	0.9	0.7	1.1	0.7	1.0	0.7	0.8	0.9	0.9
	GDB	-1.2	-3.7	0.9	-3.2	-0.1	-3.3	-1.5	-0.5	-1.7
X	SIG	16.6	17.8	14.9	18.4	15.0	20.0	16.9	12.8	13.6
	NOI	7.2	5.8	6.7	6.3	5.2	6.2	5.8	4.9	5.0
	S/N	2.3	3.1	2.2	2.9	2.9	3.3	2.9	2.6	2.7
	GN	0.6	1.1	0.7	0.8	1.0	1.0	0.8	0.9	0.9
	GDB	-4.3	0.8	-3.3	-2.2	0.2	-0.0	-2.3	-0.6	-1.5
Y	SIG	18.8	18.0	13.6	17.6	12.7	22.0	15.9	10.8	12.9
	NOI	7.4	5.6	6.5	5.1	4.8	7.4	4.2	4.0	4.[illegible]
	S/N	2.5	3.2	2.1	3.4	2.6	3.0	3.8	2.7	3.1
	GN	0.7	1.2	0.6	0.9	0.9	0.9	1.0	1.0	0.9
	GDB	-3.4	1.2	-3.8	-0.9	-0.5	-0.8	-0.0	-0.3	-0.6
Z	SIG	16.1	17.2	14.7	21.2	13.1	21.8	16.6	11.1	13.0
	NOI	6.0	5.3	5.9	6.5	4.5	7.1	4.2	4.0	3.6
	S/N	2.7	3.3	2.5	3.2	2.9	3.1	3.9	2.8	3.6
	GN	0.7	1.2	0.8	0.9	1.0	0.9	1.0	1.0	1.1
	GDB	-3.0	1.3	-2.3	-1.3	0.2	-0.5	0.3	-0.1	0.2

* D=DELTA DIFF(DEG)   A=AZIMUTH DIFF(DEG)   S=DISTANCE TO REF(KM)